IRON & COAL

THE IRON AND COAL TRADES' REVIEW

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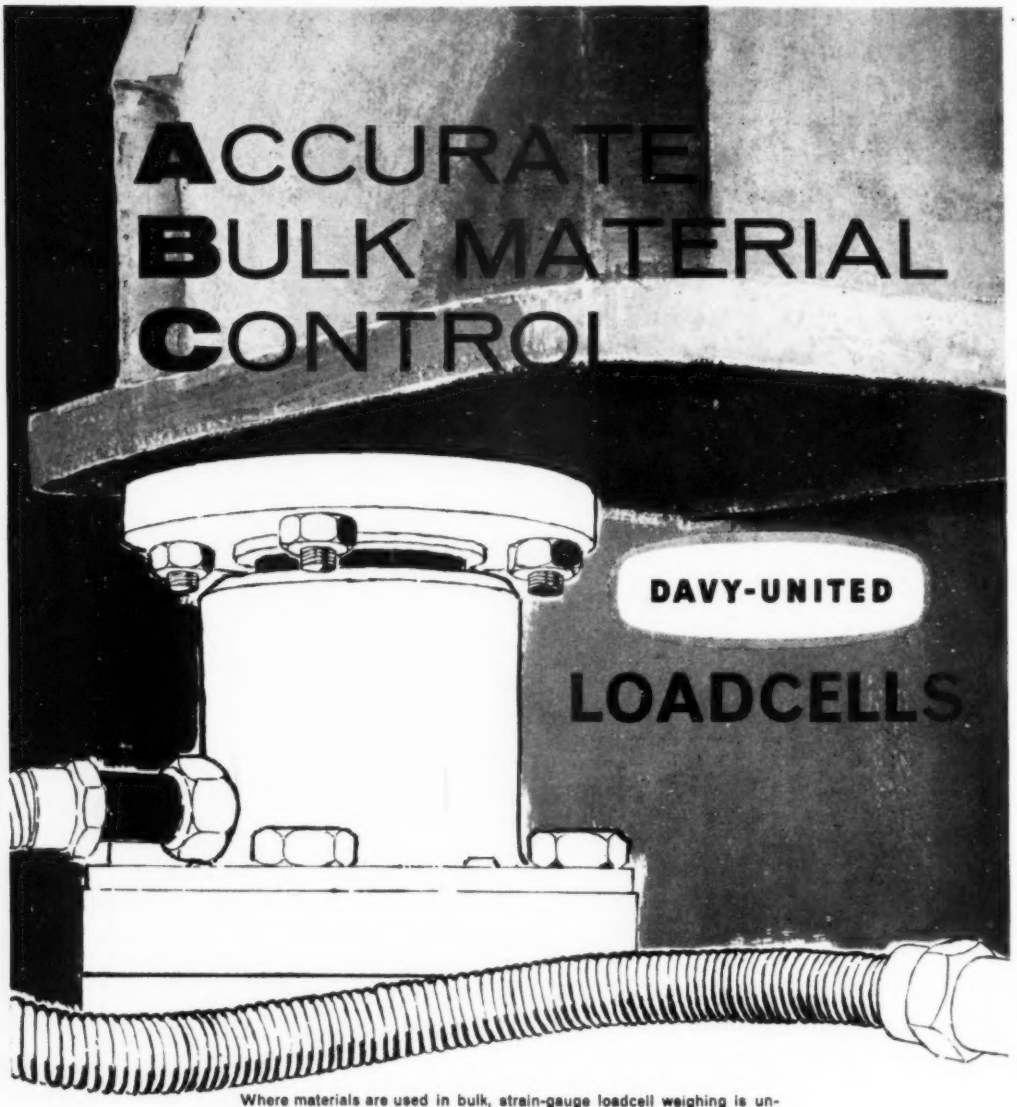

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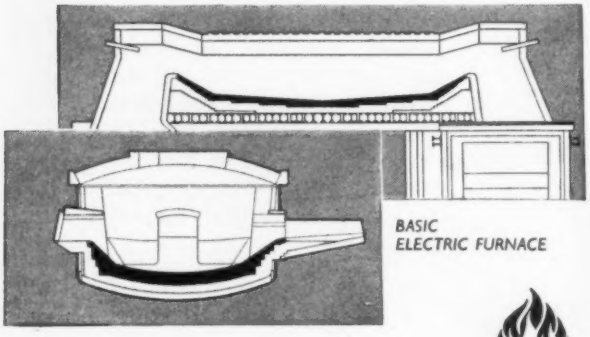

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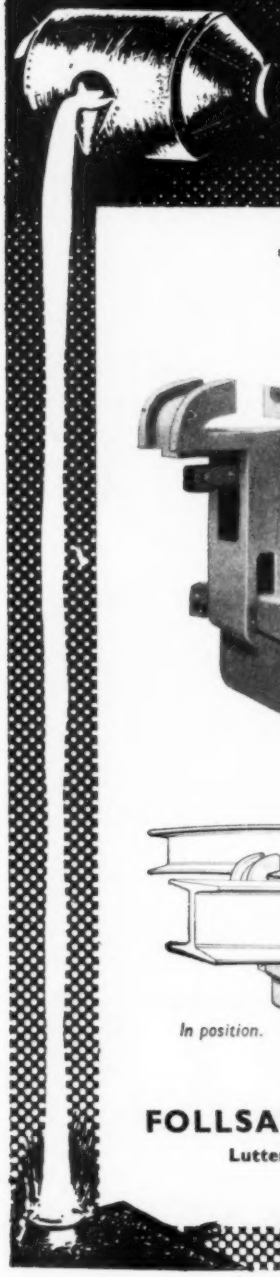

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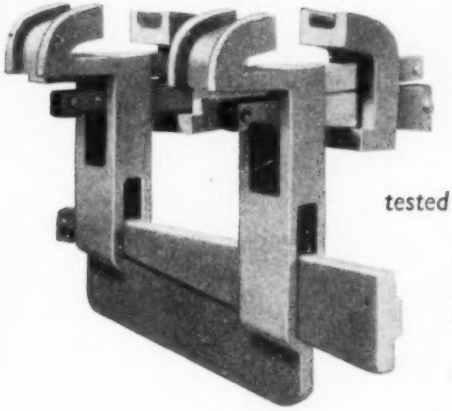

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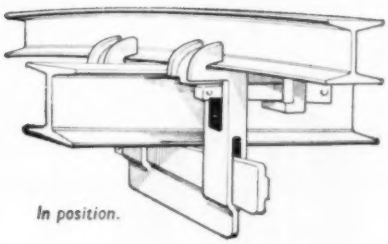

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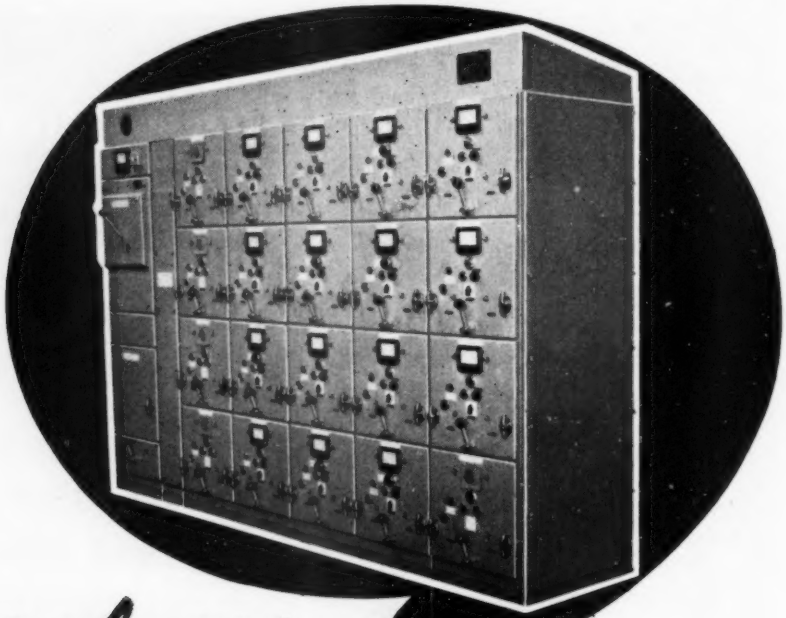

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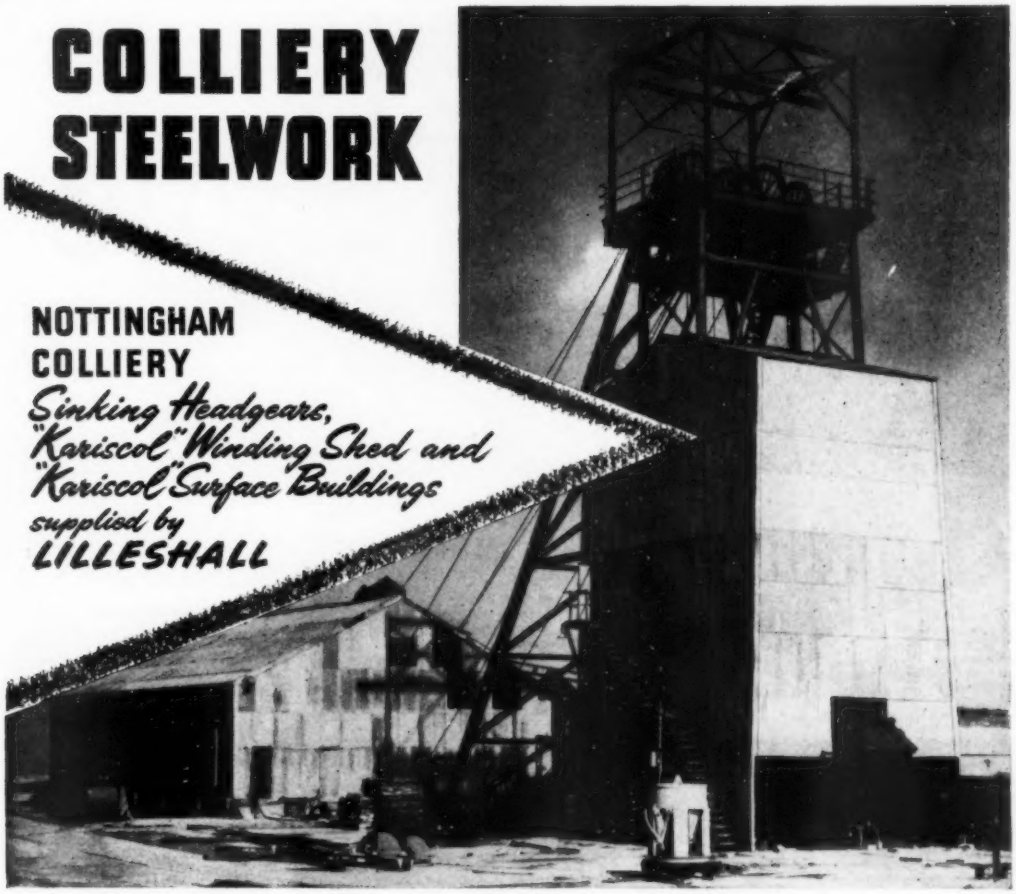

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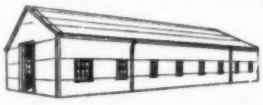

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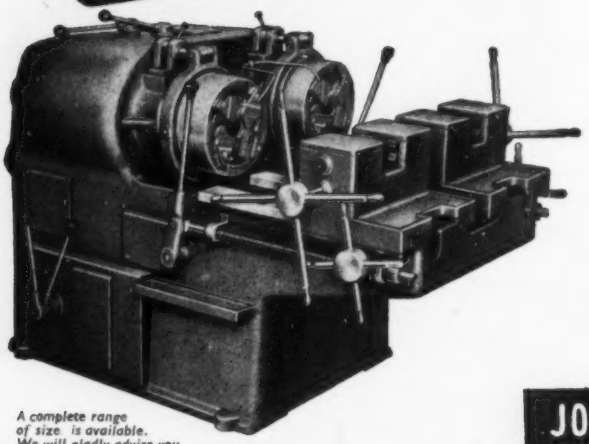

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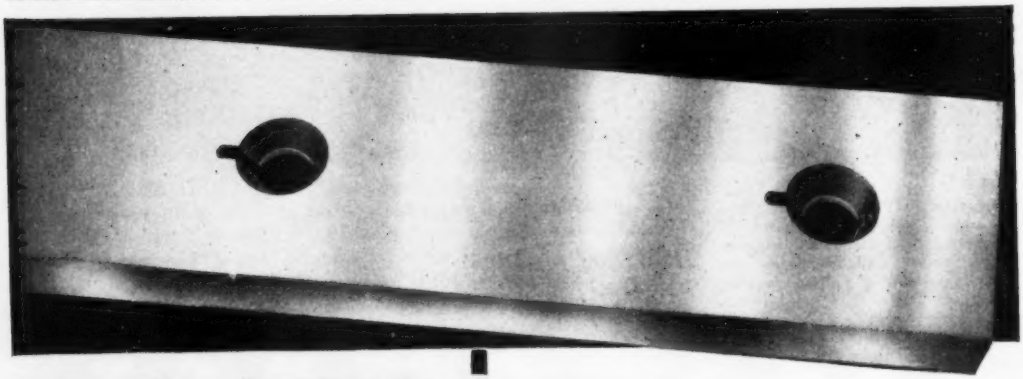

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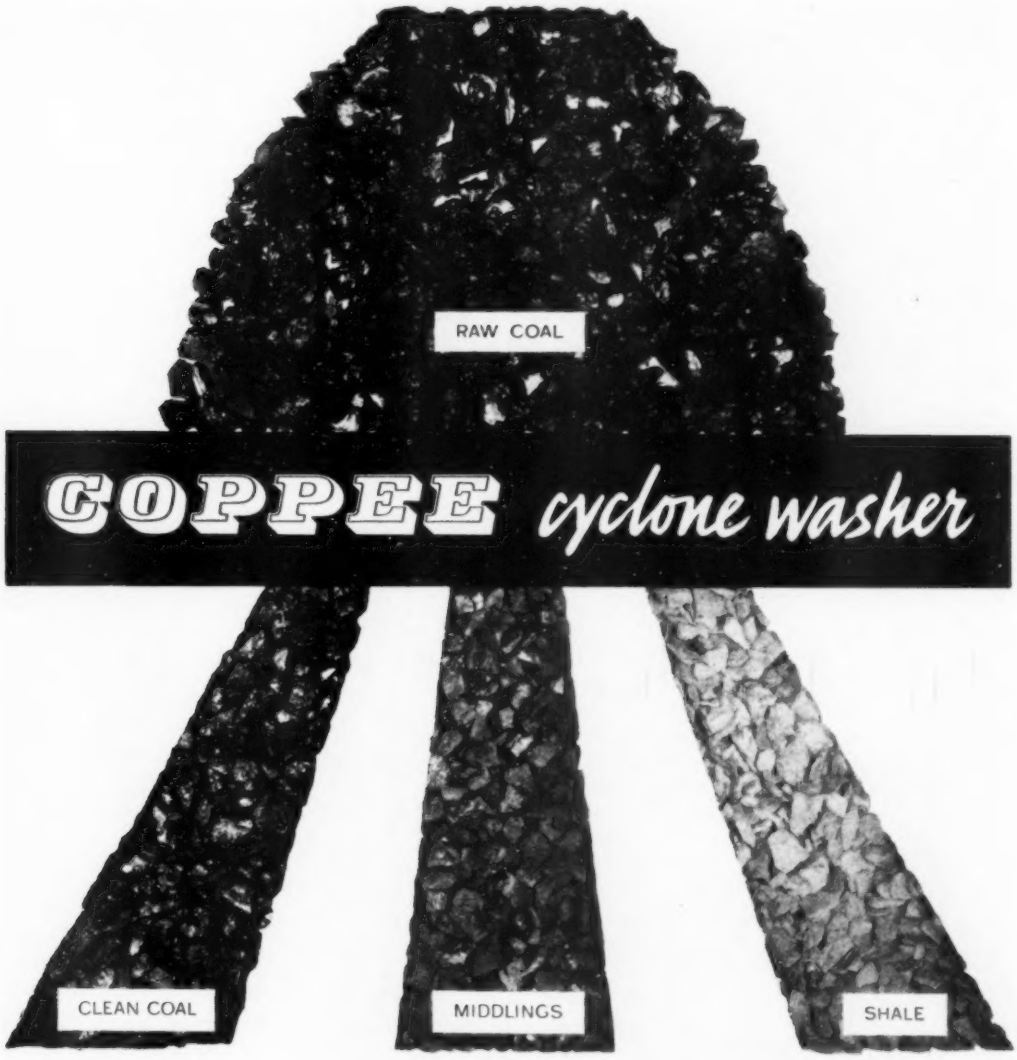

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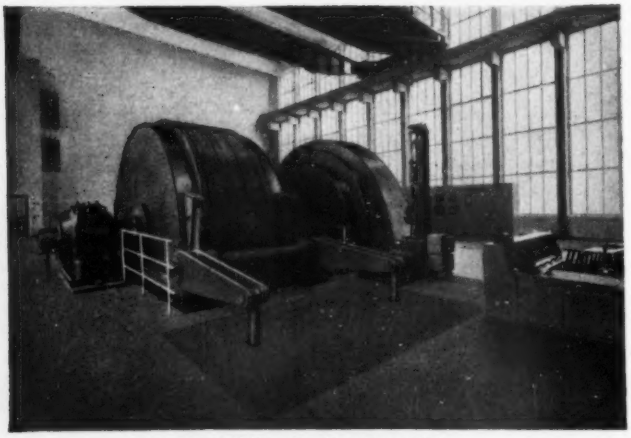

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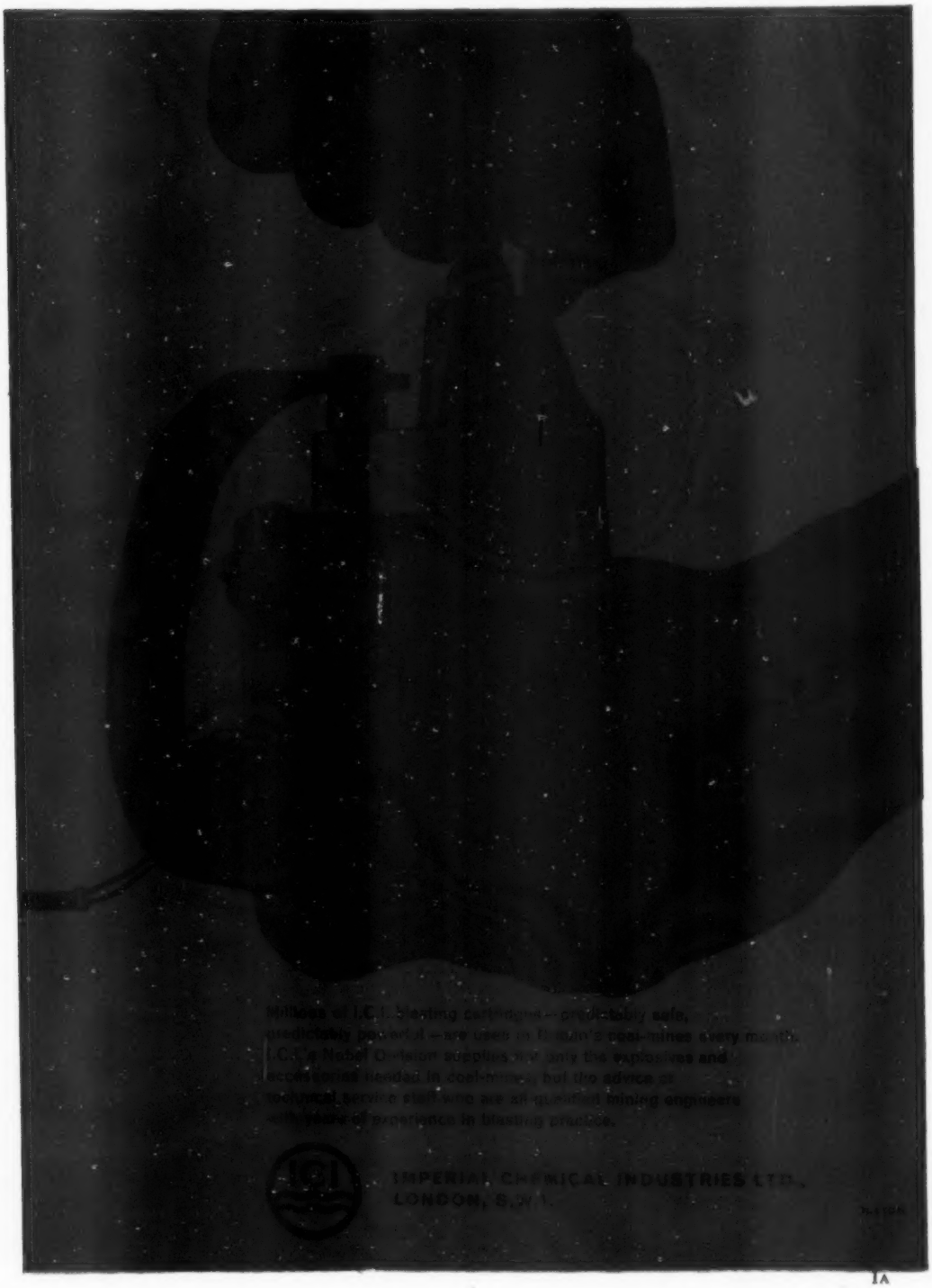
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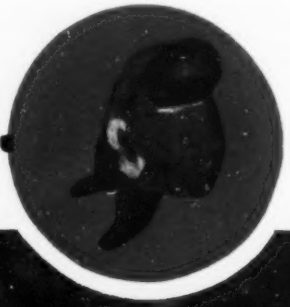

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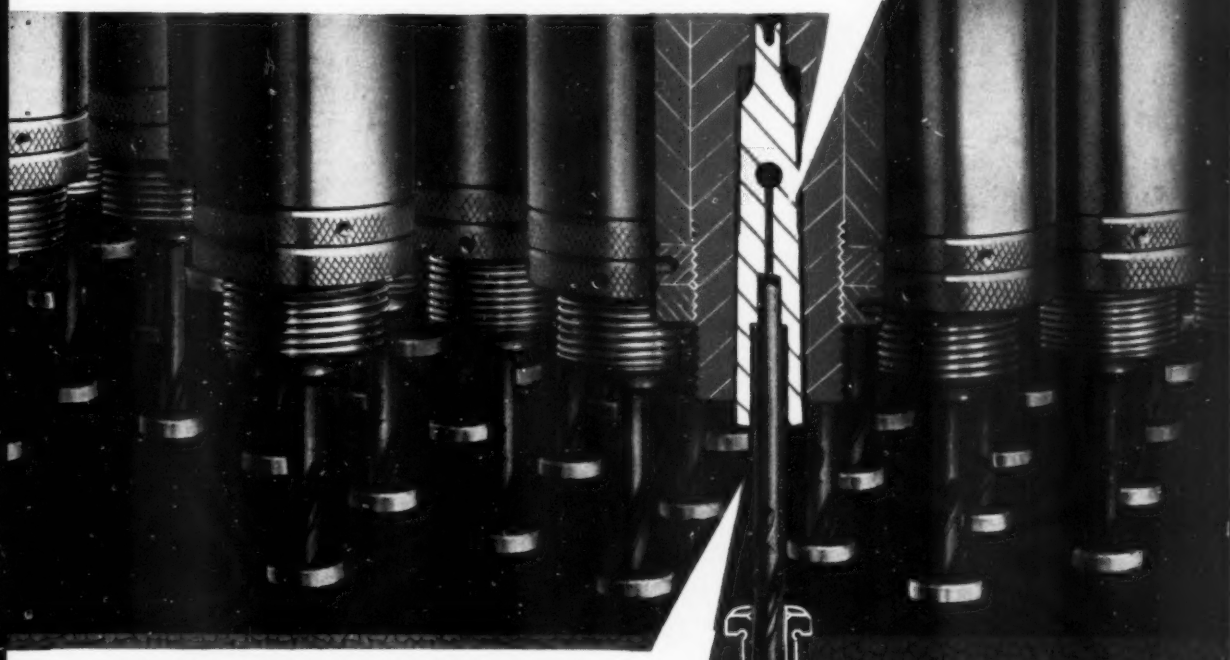

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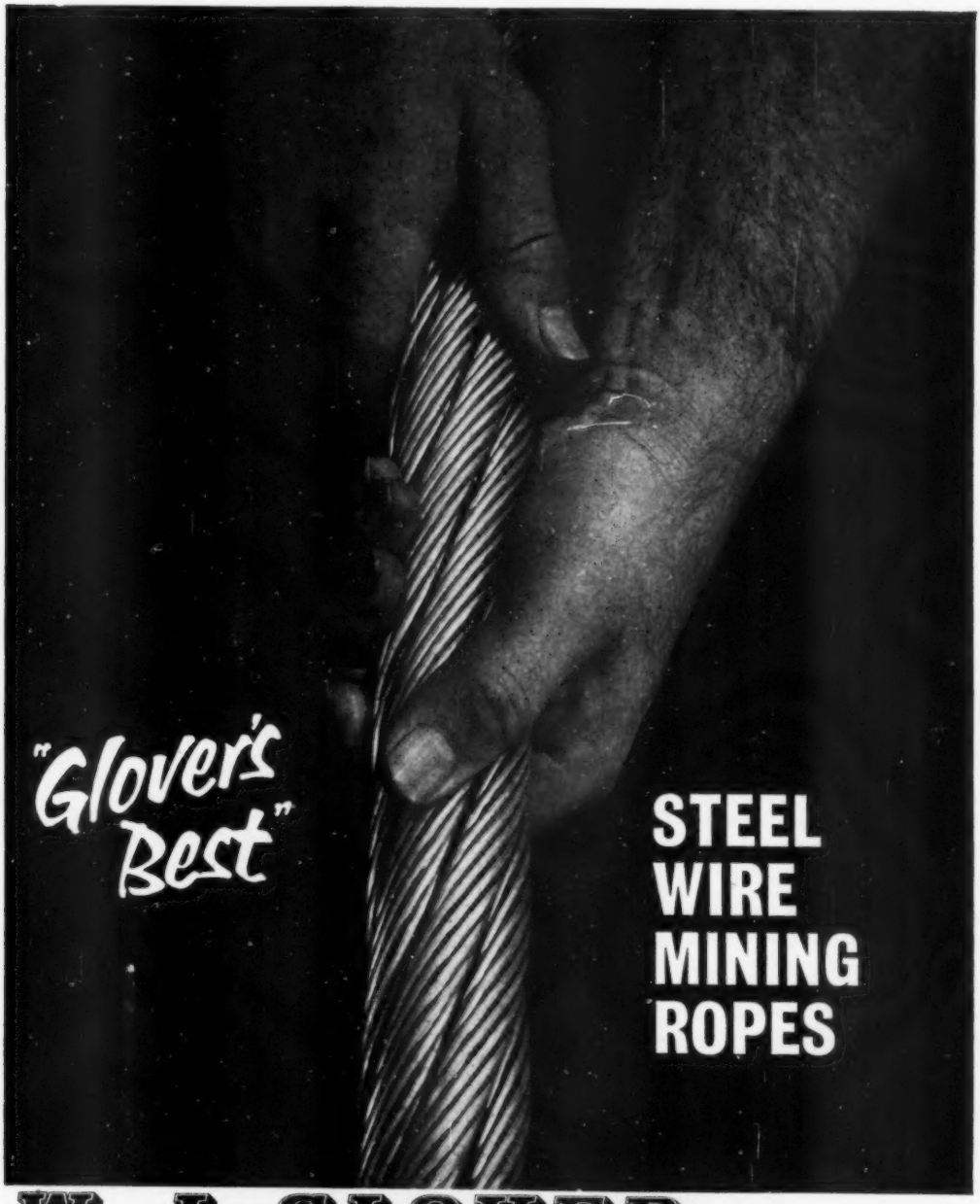

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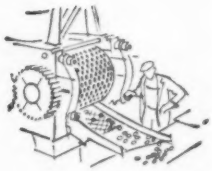

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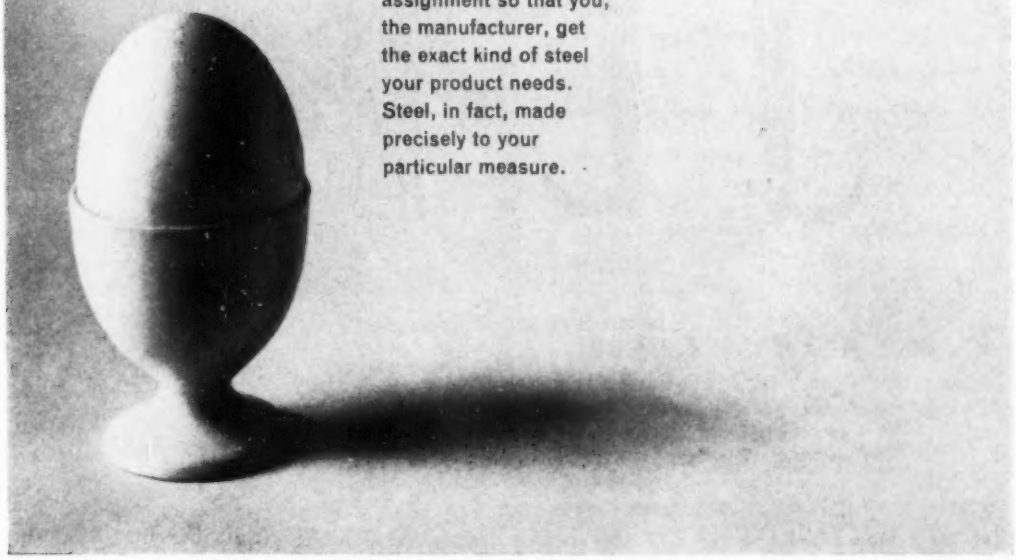

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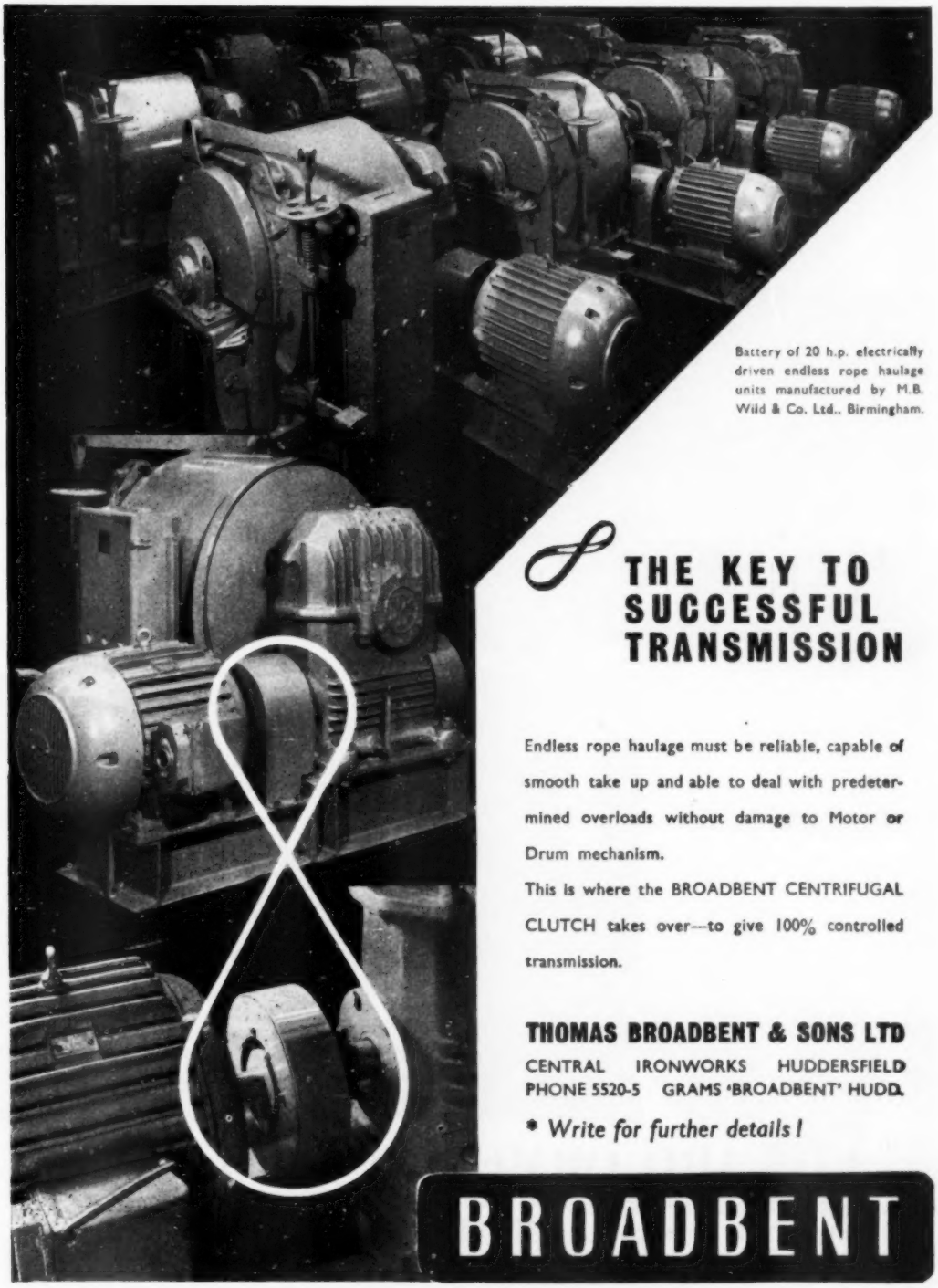

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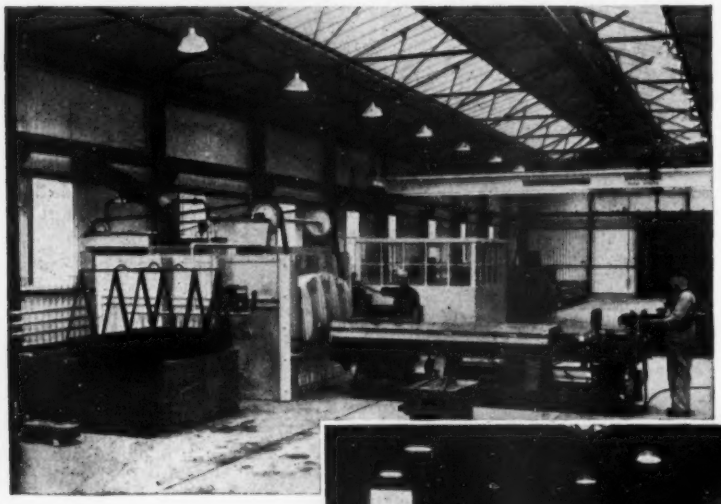

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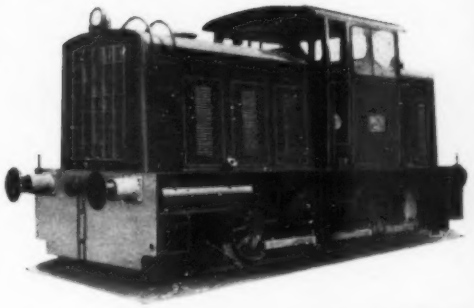

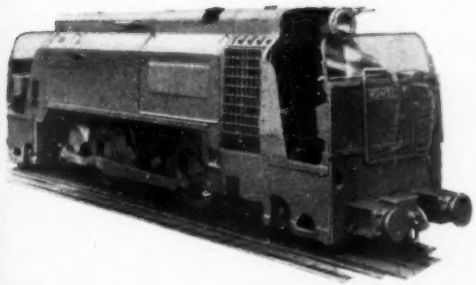

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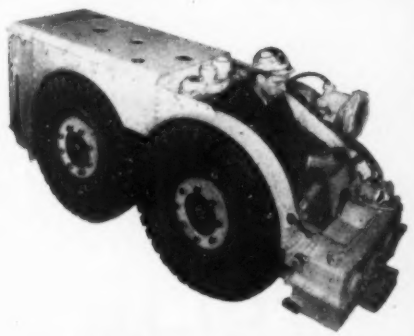

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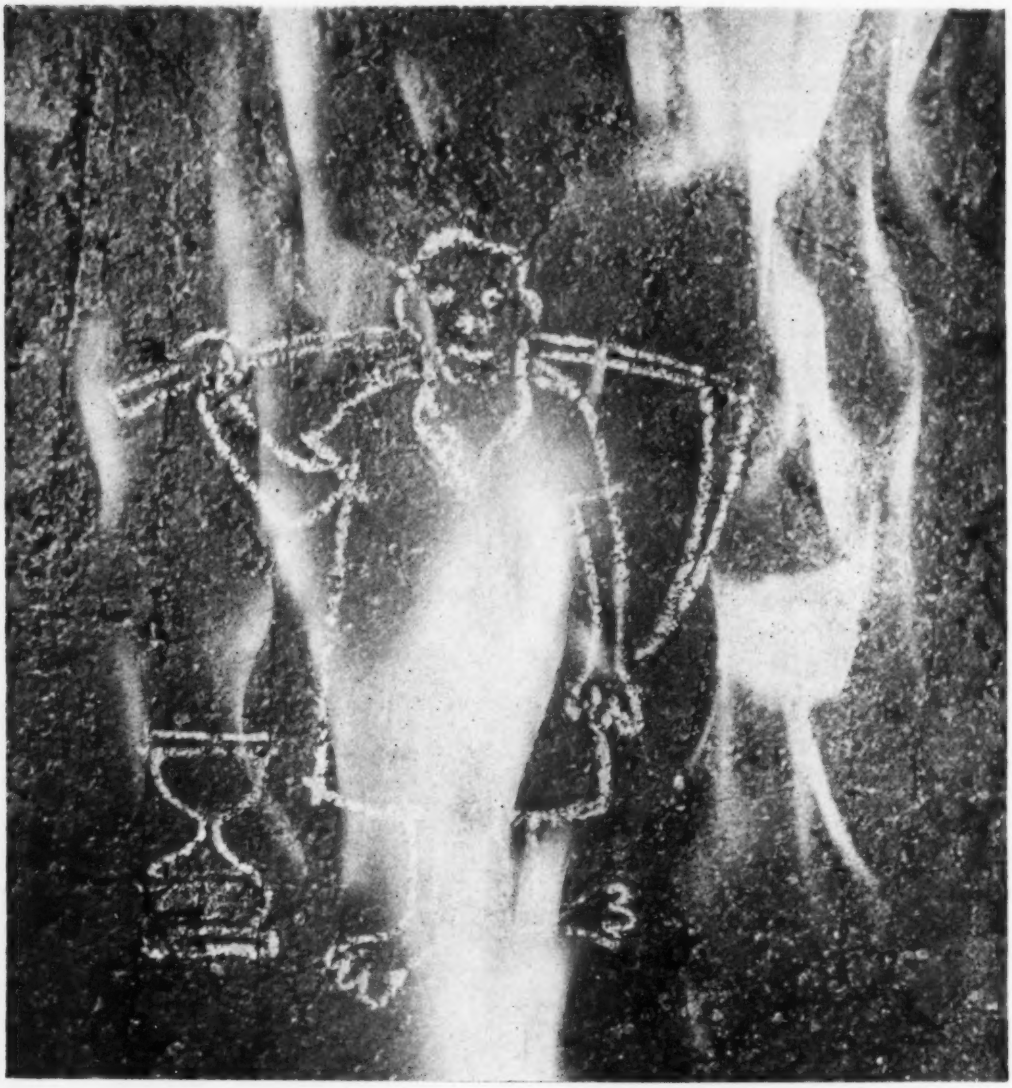

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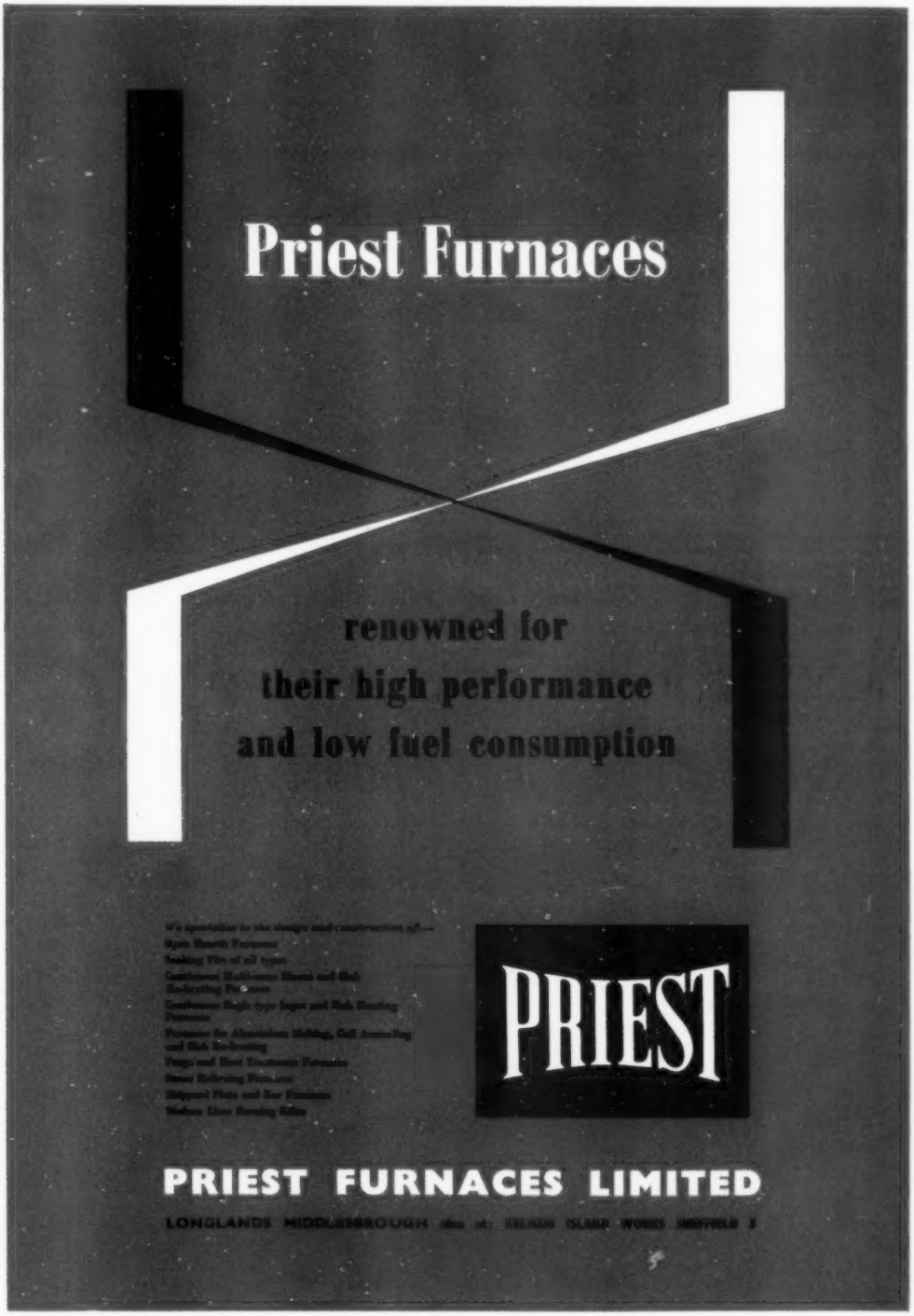
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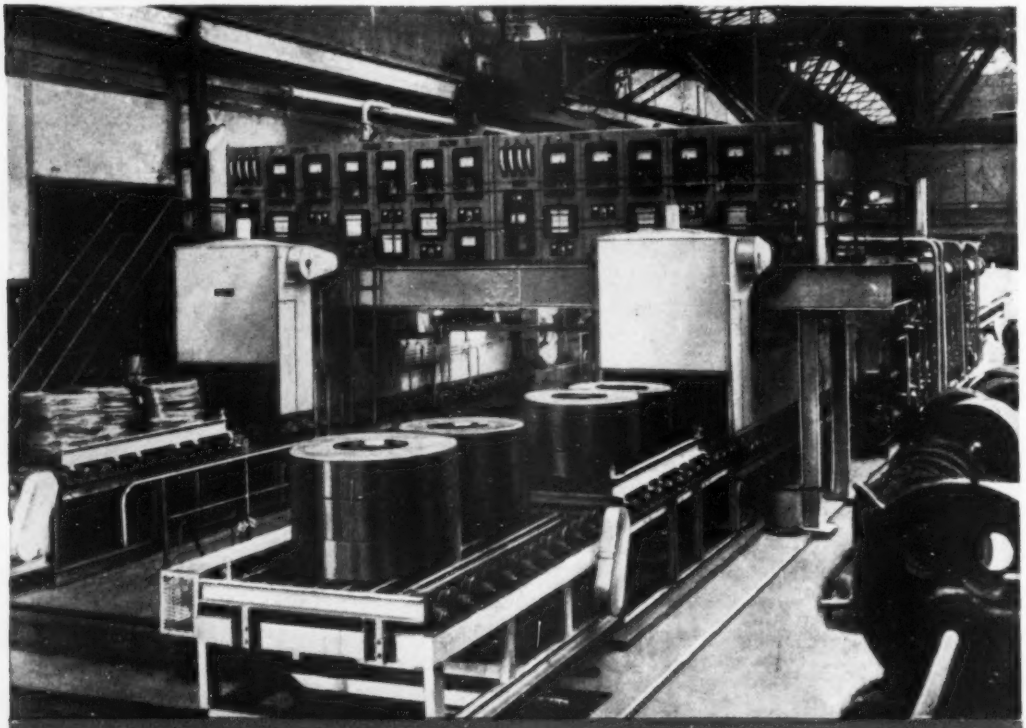

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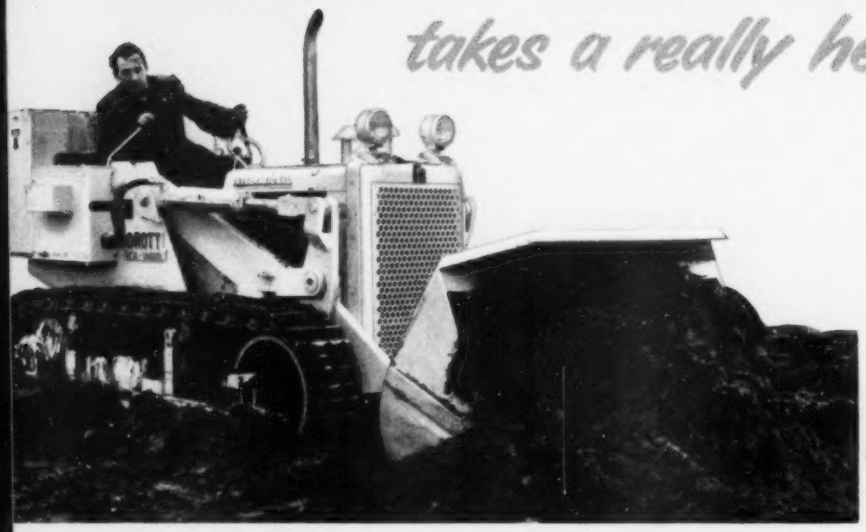
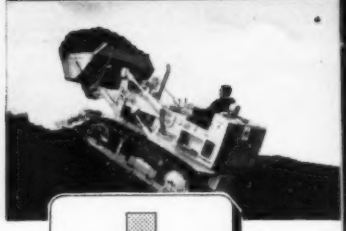
The NEW INTERNATIONAL B-8K3 DROTT SKID SHOVEL

takes a really hefty bite!





The B-8K3, which has a 1¼ cu. yd. heavy-duty bucket, is powered by the entirely new International BD-281 four cylinder diesel engine developing 60 b.h.p.

It is a ton heavier than its younger brother, the renowned B-6K3, and has a clear discharge height of 8′ 8″ under the fully dumped bucket, with a reach of 28″.

A striking feature of this machine is its modern styling with exceptional operator comfort. But of more importance are the technical features which include one-piece shovel frame construction of great strength, and a mounting system hitherto only used on larger Drott models.

All these features add up to make the B-8K3 the answer for those jobs which require that extra power . . . weight . . . and speed. Please write now for a descriptive leaflet giving full specifications.

Extra...

- ★ BUCKET CAPACITY
- ★ POWER
- ★ WEIGHT
- ★ SPEED
- ★ DISCHARGE HEIGHT
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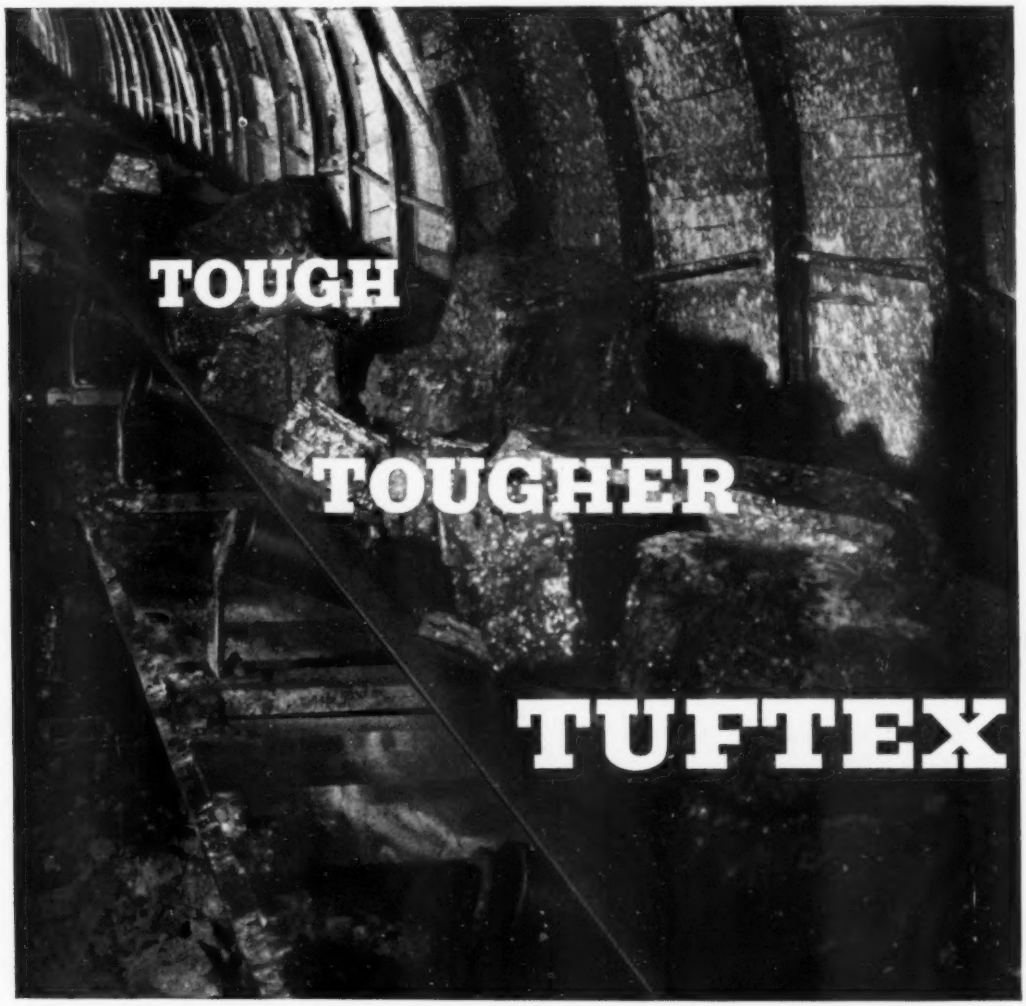

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A new concept in belt construction . . . TUFTEX, proving itself in the most difficult and sometimes hitherto impossible conditions, gives far higher impact resistance, high tear resistance, greatly improved adhesion and facilitates the use of smaller diameter pulleys. For tough, tougher, indeed the toughest of conditions, TUFTEX is doing the job.

Above—*TUFTEX belting in service at Highley Colliery on the conveyor which handles the whole of the pit's output (photograph by courtesy of the National Coal Board, West Midlands Division).*

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Engineers in Rubber and Plastics

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MINING EQUIPMENT

Crawley thin seam mining equipment includes:—

CRAWLEY-WILCOX CONTINUOUS MINERS · MOBILE BUNKER CONVEYORS
CRAWLEY MIDGET MINERS · MOBILE STAGE LOADERS
LO-HITE ARMOURED SNAKING CONVEYORS · MOBILE STAGE FEEDERS
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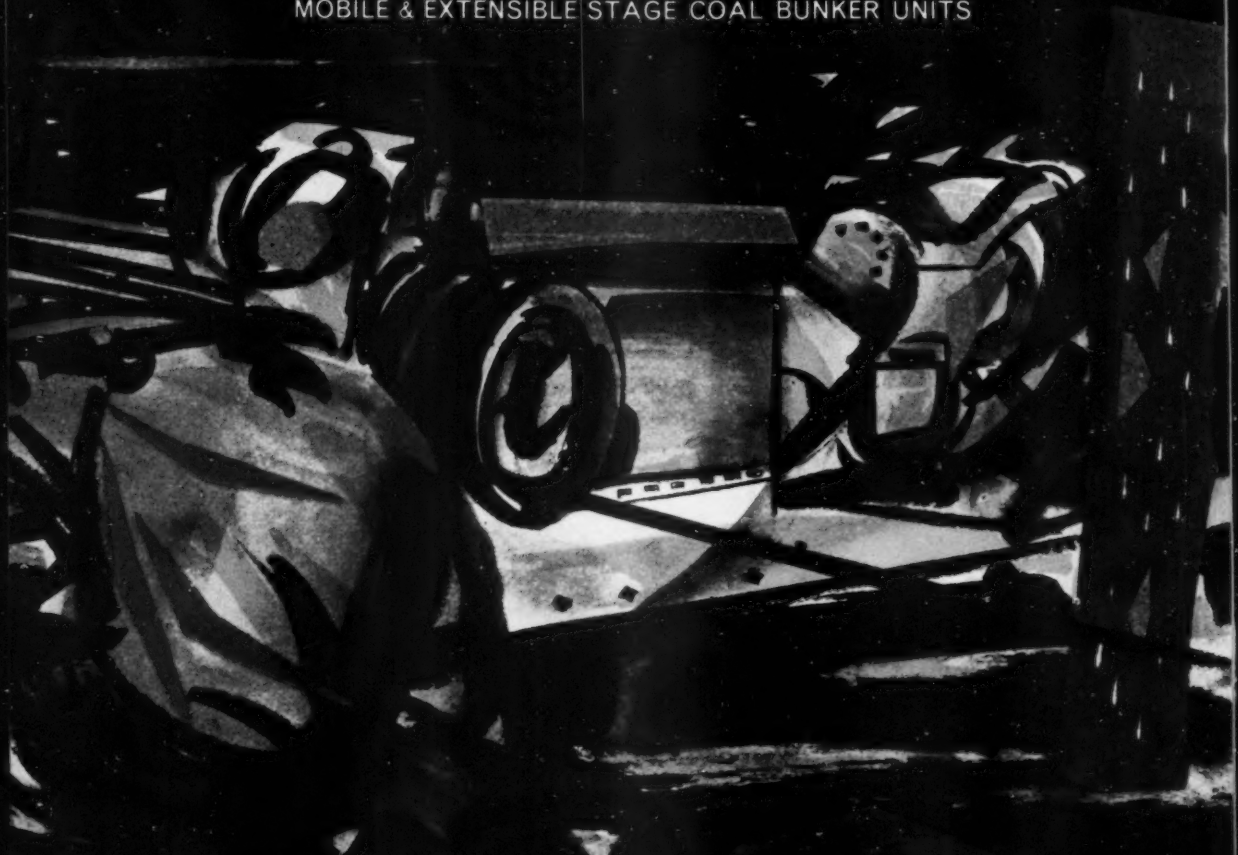

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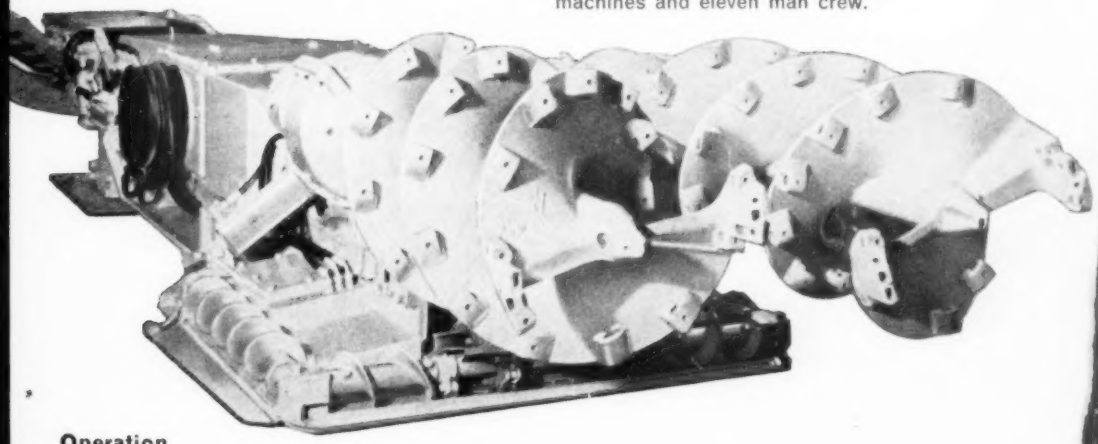
THE **CRAWLEY**-WILCOX CONTINUOUS MINER

Specification

1. Shortwall cutting machine with two augers, the diameters of which can be varied according to seam thickness.
2. Tungsten carbide cutting picks on front cutting edges and auger scrolls.
3. Flameproofed to British Standards.

Performance

1. Seams 22 in. to 46 in.
2. 300 tons per shift in 36 in. seam with two machines and eleven man crew.



Operation

1. Motor driven augers through reduction gearing rotating in opposite directions—forward oscillation prevents coal binding.
2. Hydraulic controls on machine and conveyor.
3. Coal discharges on to bridge convevor and thence on to chain conveyor.
4. Bridge conveyor pivots at either end.

Appreciation

1. The lowest Continuous Miner on the market in height, cost and maintenance.
2. Operating in conditions where other equipment has failed.

All Crawley Heavy Duty Machines have the following units standard and interchangeable:

DRIVE FRAME • GEAR BOX • GEAR ASSEMBLIES
EXTENSION SECTIONS • STRUCTURE • TAIL UNIT
CHAIN FLIGHTS

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DOBSON PROPS
DESIGNED TO AVOID STATIC LEAK

The Dobson prop is designed to meet the arduous conditions of modern mining. It is robust in construction, with the minimum of complication in design, giving highly efficient service with low maintenance cost. Its high Yield load resistance of 25 tons gives effective roof support and has the confidence of miners and officials wherever it is used.

Spherical type gland rings are used in the prop which ensure effective load carrying capacity and prevent static leakage of oil whether loaded or otherwise. Each prop undergoes a lengthy test, in the inverted position, before it leaves the works.

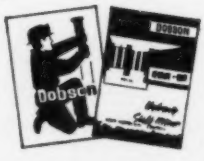
For use in wet conditions or where there is any tendency to rusting, hard chrome plated pressure cylinders (as pioneered by Dobsons) are available at a small extra charge. This treatment has given trouble free service in highly corrosive conditions for over 3 years.

DOBSON

Dobson props are available:

For seam heights 19 to 98 inches.

Yield Load ranges–25, 20 and 10 tons.



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For flame-proof colliery conveyor belting

WE TAKE NYLON...

and solid weave it into a carcass, tough and enduring . . . then we impregnate it with plastic, bonded deep into the heart of the fibres.

The result is **Fenaplast Diamond** the world's best proved coal conveyor belting, now available in five weights ranging from the new Type 2200 to Extra Heavy Diamond.

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3

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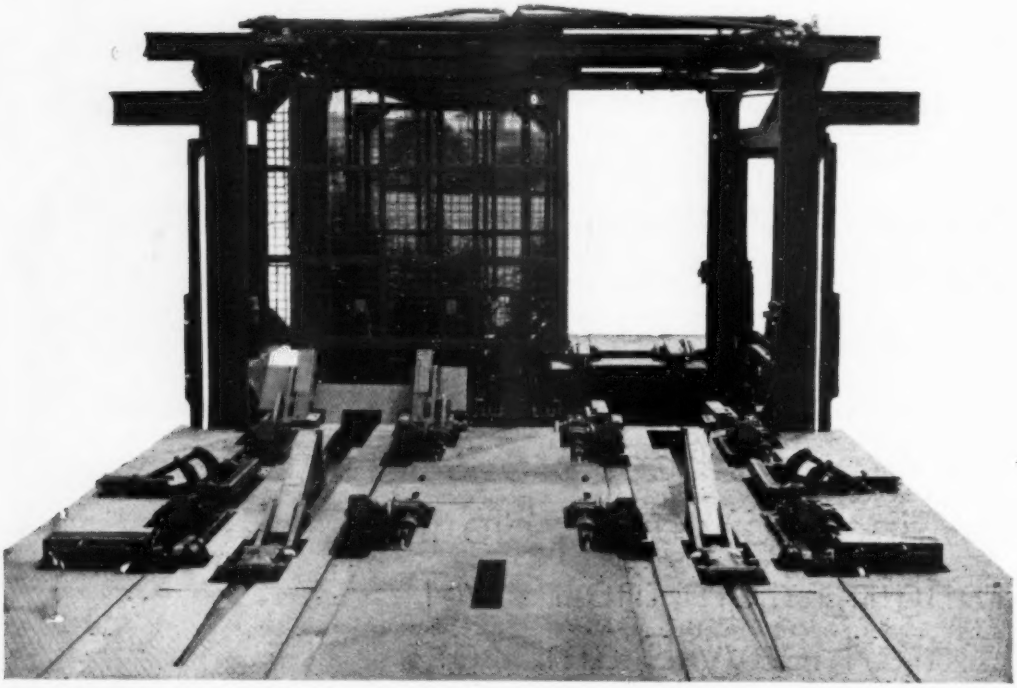
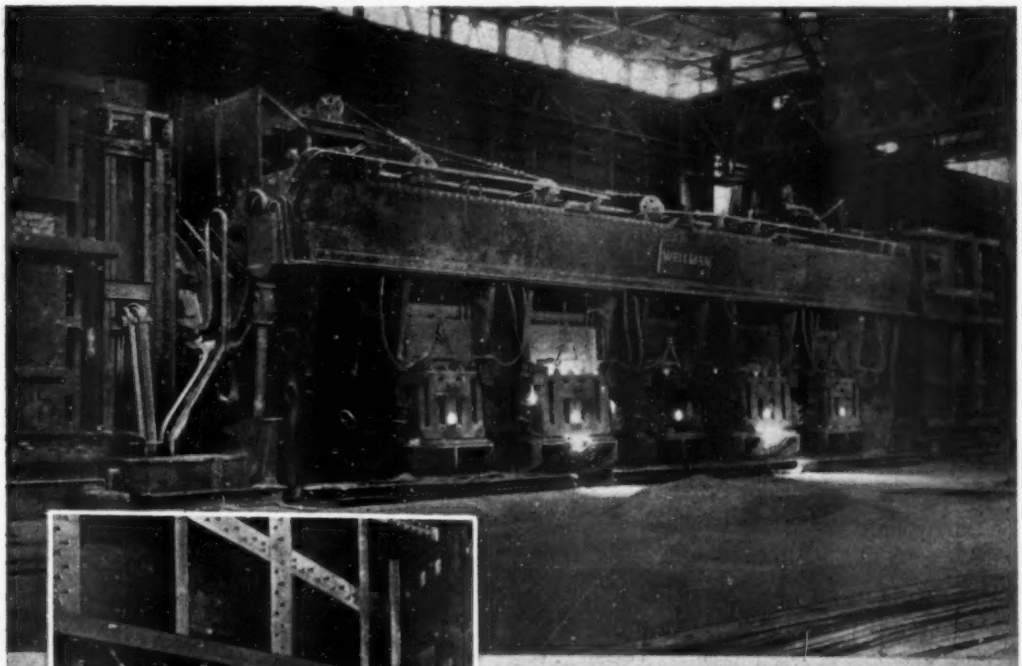
Proven at home—Chosen for abroad

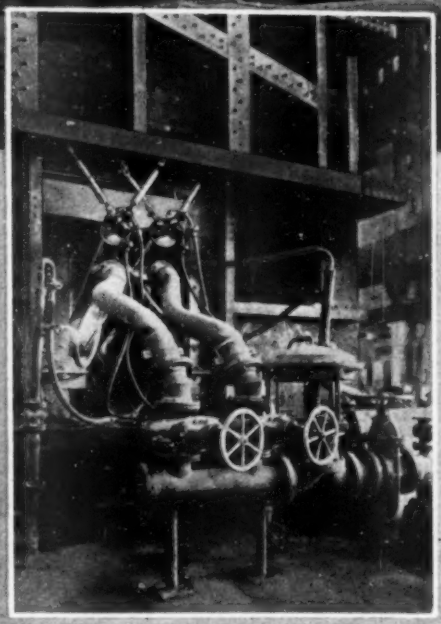


One of a series of cage decking levels being assembled for test before despatch to the Far East

WESTINGHOUSE BRAKE AND SIGNAL COMPANY LIMITED

82 York Way, King's Cross, London, N.1. Telephone TER 6432





Two of four BISRA Oil Burners firing a Wellman 300/350 ton Open Hearth Furnace in a leading British Steelworks. Two further furnaces of the same capacity and also eight smaller furnaces in this Steelworks are also equipped with BISRA Oil Burners.

BISRA
OIL BURNERS

FOR OIL & OIL/GAS FIRING OF HIGH TEMPERATURE FURNACES

Increase Furnace Productivity

Lower Fuel Consumption

Ensure better Flame Control resulting in lower Furnace Refractory Maintenance Costs

Reduce Steam Requirements for the same flame conditions

Easy and Inexpensive to install

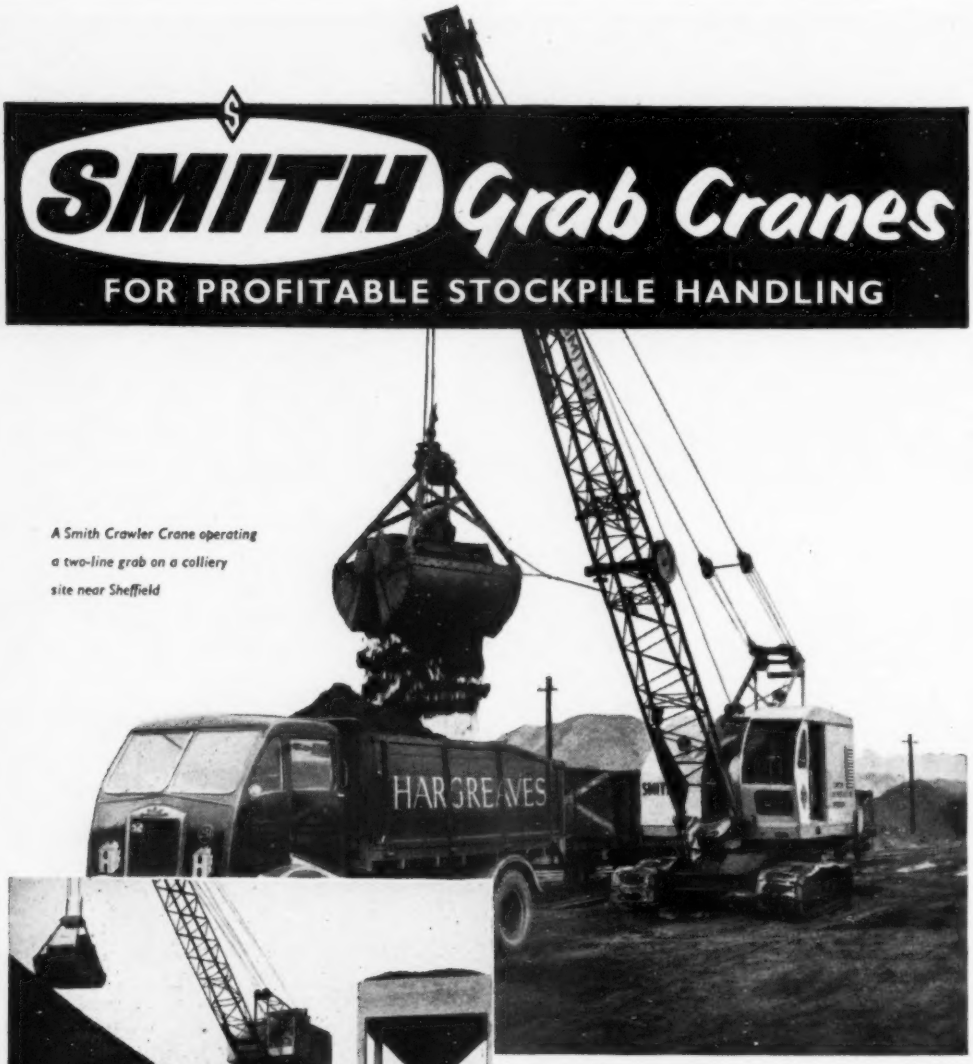
Simple in design

THE WELLMAN SMITH OWEN ENGINEERING CORPORATION LTD.

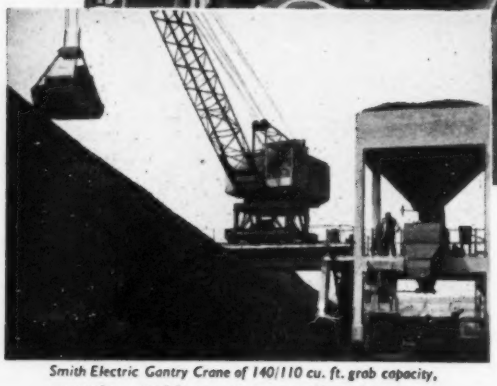
PARNELL HOUSE, WILTON ROAD, LONDON, S.W.1 WORKS: DARLASTON, South Staffs, & BELFAST.

SMITH Grab Cranes

FOR PROFITABLE STOCKPILE HANDLING



A Smith Crawler Crane operating a two-line grab on a colliery site near Sheffield



Smith Electric Gantry Crane of 140/110 cu. ft. grab capacity, mounted on a special runway to cover a wide stacking area.

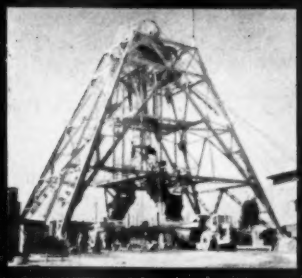
Here are two of the many SMITH GRABBING CRANES employed at the depots of regional Gas Boards — a diesel crawler crane and a special gantry crane. Smiths also make diesel rail cranes for this and similar duties.
Particulars of any type will be supplied on request.

You can really **SHIFT IT** *with a* **SMITH!**

THOMAS SMITH & SONS (RODLEY) LTD · RODLEY · LEEDS · ENGLAND

UNDERMINING HIS LAIR?

—not quite, but the lion is not so far from Northern Rhodesia's Mufulira West mine where Cementation completed to schedule four new shafts totalling 9431 feet despite difficult granite conditions. Mufulira highlight —a record 468 feet sunk and lined in one month at No. 14 Shaft (below).



In Africa and many other countries mining engineers of the Cementation Group of Companies maintain their world-wide reputation for deep workings. Into the granites of Northern Rhodesia's Copperbelt, deep into the salt beds of New Mexico, through unstable water-bearing sands to Canada's salt deposits, and down to the coal measures of Britain, Cementation engineers drive their shafts. Their specialist knowledge, based on more than 40 years' experience, provides the key to the most economical methods of working in any kind of strata — shafts, underground reinforced concrete constructions, pit bottoms and junctions, tunnel drivage, underground dams, pneumatic stowing. Mining engineering is one of the Cementation Group's comprehensive services embracing civil engineering, building, piling, vibroflotation, cementation, guniting, soil stabilisation and site investigation.

Cementation

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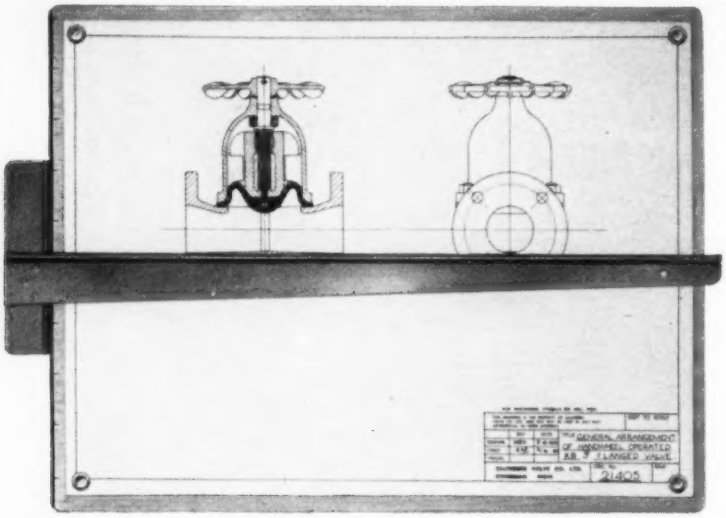
Head Office: 52 Albert Embankment, SE1
And India, Pakistan, Middle East, Rhodesia, South Africa, West Africa, Australia, Canada, New Zealand, Portugal, Spain and Brazil



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SAUNDERS KB VALVES are used in Chemical Works, Coke Ovens, Coal Mines, Food Factories, Sugar Refineries, Paper Mills, Sand, Gravel & Cement Works, Accumulator Factories, Sewage Works and related plants

When straightness of bore in a valve is as vital as sure closure or isolation of its working parts—or glandless, leak-tight construction—or the simplest of all maintenance routines—then it is useful to know that you get ALL these qualities in SAUNDERS TYPE K B. VALVES

SAUNDERS KB VALVES are handling Abrasive slurries, Electrolytic Manganese Dioxide, Silicon Sands & Slurry, Phthalic Acid (aqueous), Manganese Sulphate, Foodstuffs, Pulps, Powders and many other Chemicals and not-so-fluid-fluids

SAUNDERS DIAPHRAGM VALVES

The T square shows how easy is rodding through for clearing obstructions and emphasises the excellent flow characteristics.

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DIAPHRAGM VALVE DIVISION
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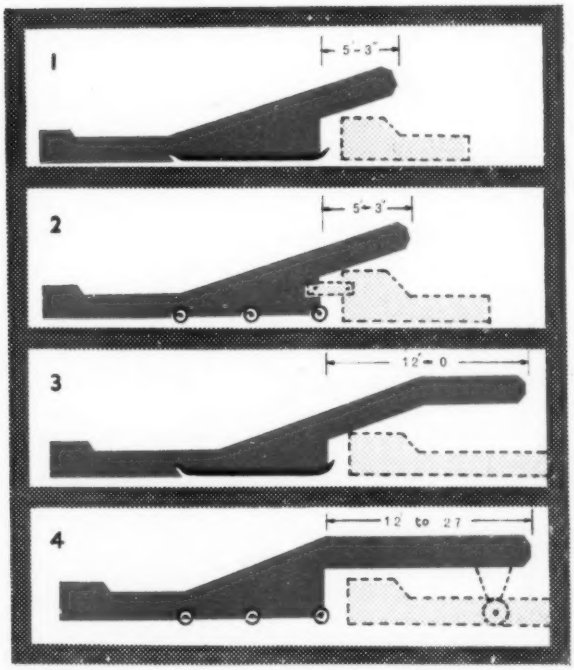
"HORSES FOR COURSES"

Applied to underground mechanisation it means exactly the same thing as:— "THE RIGHT MACHINE FOR THE JOB". The Cowlishaw Walker armoured gate feeder or stage loader is exactly this, it is not an improvisation of a machine originally designed for other duties. It was designed expressly for efficient coal clearance at the ripping lip of a power loaded coal face.

It was originally made in the 24 inch size only, but is now available in the 30 inch width as well to cater for the higher concentrations of tonnage which recent developments in mechanisation have made possible. Its versatile design allows it to be supplied in a variety of forms to suit individual needs and on the 30 inch size it can be arranged to advance under its own power.



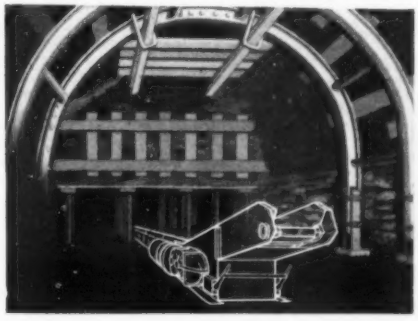
1 It may have a short jib and be mounted on a sledge.

2 It may be mounted on wheels, be permanently attached to the tail unit of the gate belt, the whole being pulled forwards together.

3 It may have a cranked jib giving extra discharge room.

4 Or it may have an extra long jib supported on wheels and if required on the 30 ins. size it can advance under its own power.

The right machine for the job



COWLISHAW WALKER & CO. LIMITED

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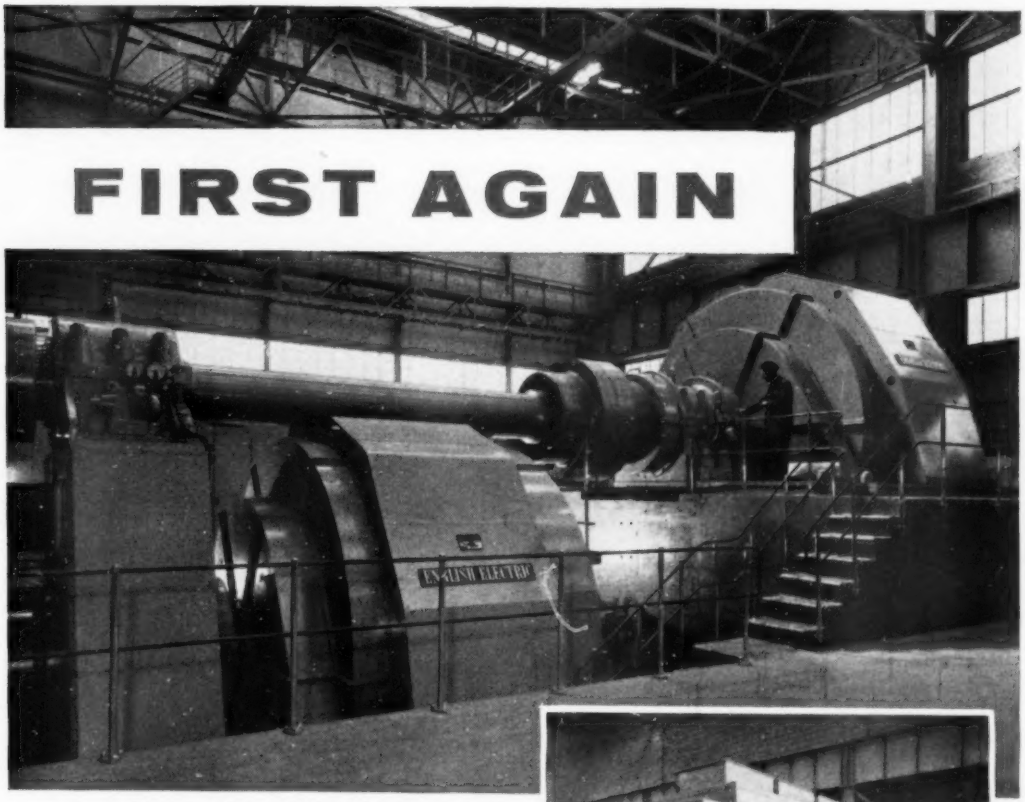


FIRST AGAIN

Photographs by permission of Consett Iron Company

For the first time in Britain, power for twin drive motors for a hot reversing mill has been supplied from mercury arc converters.

Designed and manufactured by 'ENGLISH ELECTRIC' for the new Hownsgill Plate Mill of Consett Iron Company, the motors have a combined output of 10,360 h.p. (r.m.s.) at 45/80 r.p.m., with a cut-out torque of 492 metre tons, equivalent to 31,080 peak h.p.

'ENGLISH ELECTRIC'

steelworks equipment

In addition to the main motors, 'ENGLISH ELECTRIC' manufactured and supplied mercury arc converters, Ward Leonard auxiliary drives for mill auxiliaries and shear drives, ventilation for motor room and converter equipment, constant voltage d.c. mill type motors, and the major part of the control gear associated with this mill.

Over fifty years' world wide pioneering experience stands behind 'ENGLISH ELECTRIC' service to the metal industries and is available to help in the solution of your particular problems.

METAL INDUSTRIES DIVISION, STAFFORD

The English Electric Company Limited, English Electric House, Strand, London, W.C.2

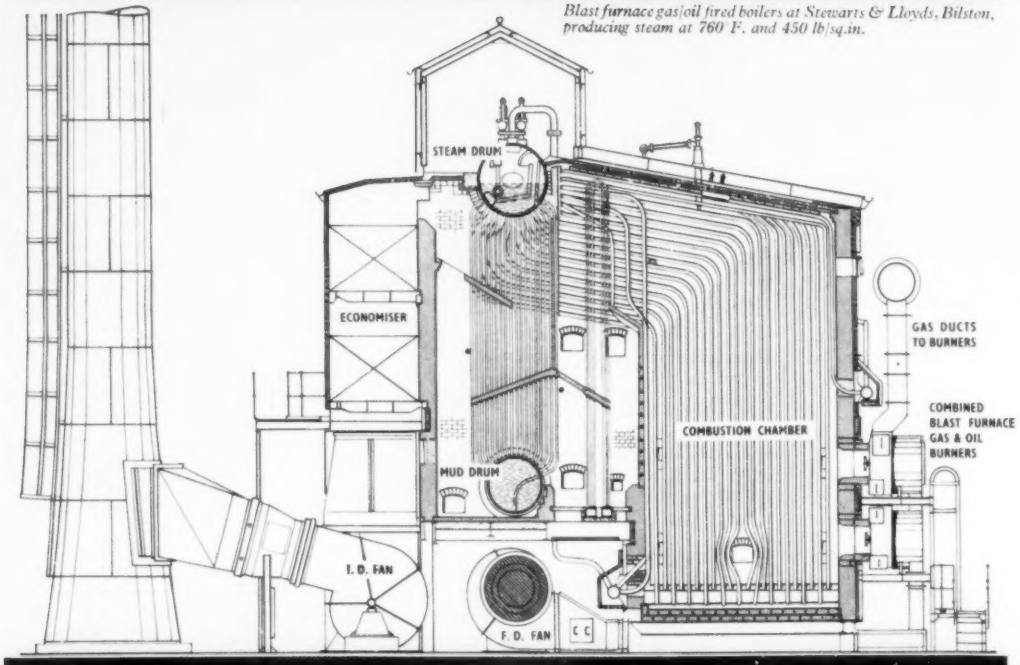
MT.61

THE STEEL INDUSTRY AND JOHN THOMPSON

Great names in Steel, all using John Thompson Steam Generating Plant.

APPLEBY-FRODINGHAM, DORMAN LONG, FIRTH-VICKERS, SAMUEL FOX, GUEST KEEN & BALDWINS, STEEL COMPANY OF WALES, STEWARTS & LLOYDS, JOHN SUMMERS, RICHARD THOMAS & BALDWINS.

Blast furnace gas/oil fired boilers at Stewarts & Lloyds, Bilston, producing steam at 760° F. and 450 lb/sq.in.



John Thompson have supplied the Steel Industry with both natural and forced circulation water tube boilers fired with oil, blast furnace gas, coke breeze and coal; they have also installed a number of waste heat boilers, including forced circulation door frames on S.M.O.H. furnaces.

JOHN THOMPSON WATER TUBE BOILERS LTD. WOLVERHAMPTON

JOHN THOMPSON GROUP

WTB/14

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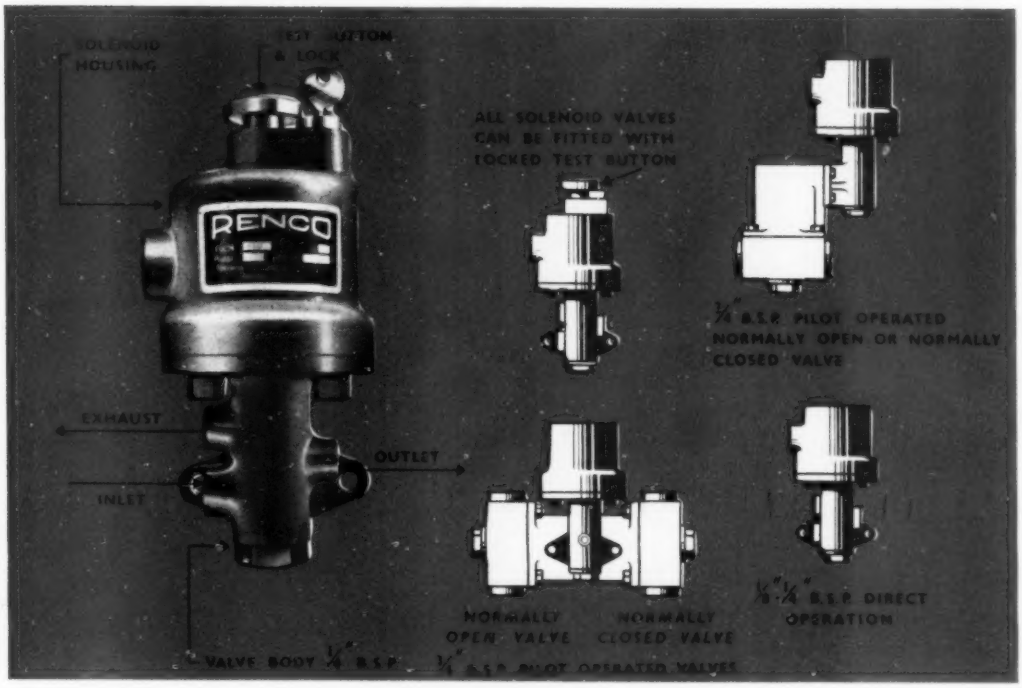
FOR AUTOMATIC AND REMOTE CONTROL



- *Interchangeable units give maximum versatility*
- *Totally enclosed dust-tight housings*
- *Stainless steel wearing parts —plated springs— gun-metal valve body*

Compact and versatile, Renco Solenoid Valves have proved absolutely reliable in millions of operations. They are suitable for use with various electric, electro pneumatic and pneumatic systems, circuits and special purpose designs.

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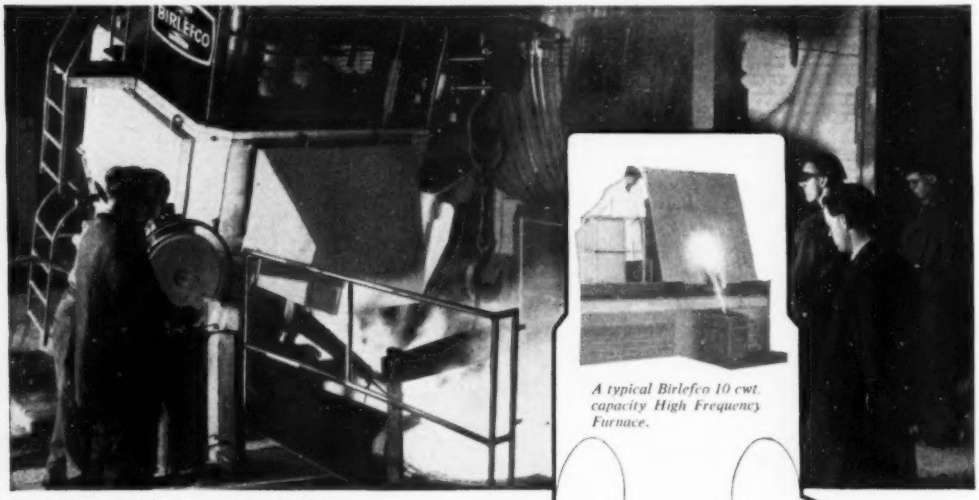

Pouring from a Birlefco 3 ton capacity Arc Furnace.

A typical Birlefco 10 cwt. capacity High Frequency Furnace.

BIRLEFCO **FURNACES AS BIG OR SMALL AS THE JOB IN HAND**

Whatever your production demands Birlefco can provide the most suitable melting equipment, be it a few hundredweights of special tool steel or bulk steel production for agricultural machinery and earth moving equipment. If there's metal to be melted, Birlefco present a unique combination of design, experience and manufacturing skill, always abreast of new trends and new techniques.

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Specialists in all types of melting equipment; Arc Furnaces from 1 to 150 tons capacity; Mains Frequency and High Frequency Melting Plant from 10 lbs. to 20 tons capacity; Induction Heating Equipment.

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Vol. 183
No. 4857

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THE IRON AND COAL TRADES' REVIEW

AUGUST 18, 1961

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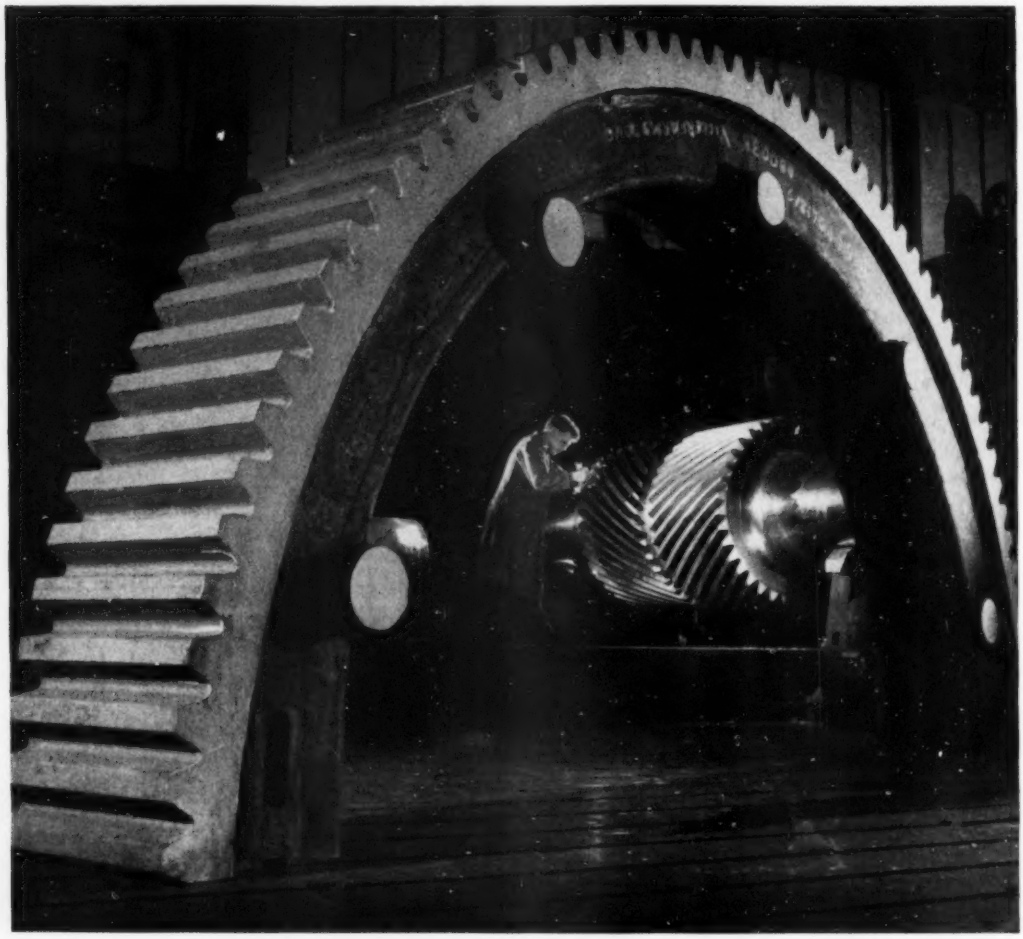

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IRON & COAL
THE IRON AND COAL TRADES REVIEW

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Coal Output and Supplies

UNITED KINGDOM production of coal in the 30 weeks ended July 29 was 110,566,000 tons, showing a fall of 3,296,000 tons on the tonnage produced in the corresponding period of 1960. In the same 30 weeks of this year inland consumption totalled 111,994,000 tons, compared with 113,205,000 tons. The decline in output was more or less in accordance with expectations. The falling off in consumption is disappointing, though perhaps that, too, was not wholly unexpected. There was a useful increase in exports and bunkers during the period from 3,146,000 to 3,270,000 tons, but even so the total of inland and export demand was more than 1,000,000 tons down compared with the first 30 weeks of 1960.

The coal industry has set for itself—or has had set for it—a target of 200,000,000 tons of coal sales a year. The plan at the beginning of 1961 was to produce below that figure this year, and so reduce the stocks which in earlier periods had been such a burden on the industry. The broad idea after 1961 was to aim for 200,000,000 tons of output and to add to or withdraw from stocks as sales fell below or advanced beyond the planned output figure. Since the beginning of the current year undistributed stocks have fallen by 6,400,000 tons, and the finances of the National Coal Board have benefited accordingly, bookkeeping transaction only though it may be. Production this year will fall below total sales on the figures for the year so far, but there are still nearly 23,000,000 tons of coal in undistributed stocks, so that there need be no fears of an overall shortage. It does not follow that some grades and sizes will not be in short supply; the house-coal situation, for example, does not look all that secure. The overall coal supply situation may be likened to that of the solid smokeless fuels. In theory, there is enough smokeless fuel to meet requirements; in practice, there is not enough of the quality smokeless fuels available to satisfy customers' needs.

The fact that statistically things have gone as expected does not eliminate all misgivings about coal production and supplies. Not all the figures shown up by an examination of the results of the first 30 weeks give satisfaction. On the credit side is an advance from 1.401 to 1.433 tons in the overall output per manshift and an advance from 3.959 to 4.134 tons in the face OMS. If to ask for more suggests an Oliver Twist-like mentality, it may perhaps be recalled that Oliver's cry was not born of greed: he needed more, and the coal industry needs a more rapid advance in productivity than it has so far achieved—or has been vouchsafed—if it is to meet its costs and at the same time ensure the price stability that is essential to its survival. On the debit side is a loss in the 30 weeks due to disputes of 1,592,800 tons of coal. To argue that, overall, this tonnage was not needed to meet the demand is to beg the question. In point of fact some of the grades of coal lost were badly needed, and, this apart, there was an obvious financial loss which the NCB could ill afford to bear. It is surprising, and highly disturbing, that costly disputes still occur in an industry possessing conciliation machinery which is supposed to be unmatched anywhere else in the country. It is a sad fact that industrial relations in coal are not yet what they should be.

The total number of workers on the colliery books on July 29 was 565,700. The average weekly figure over the 30 weeks was 576,190, compared with 612,830 in 1960, and it seems that the figure is still declining. In some coalfields the decline is too rapid to be comfortable, and the NCB is making strenuous efforts to stem the drain on manpower.

Although undistributed stocks—on the ground and in wagons at collieries and open-cast sites—have been substantially reduced, distributed stocks on July 29 amounted to 15,876,000 tons, as compared with 13,936,000 tons on July 30, 1960. To the extent that this is due to reduced usage it is a matter of regret to the Coal Board, but it results also from the general tendency to keep larger reserves at the sources of consumption, and this is a trend which the board welcomes and encourages, for it transfers part of the financial burden of holding stocks from the shoulders of the producers to those of distributors and consumers.

Merchants' stocks of house coal represented on July 29 1.8 winter weeks' consumption, while their stocks of anthracite and boiler fuel amounted to 3.8 weeks' peak consumption. Both figures represent a creditable improvement on July, 1960, for at current prices the carrying of stocks bears heavily on merchants, and the public unfortunately are slow payers. Some of them say they would stock more coal if they could get the qualities they want. But whether the problem is one of supply or finance, a little more coal at distributors' depots is obviously desirable. Even more desirable are adequate stocks in householders' store places. This has not been exactly a hot summer, taken all in all, yet over the 30 weeks the average temperature shows a rise of 0.3 deg. F. Average temperatures

affect coal consumption more than is sometimes realized. This winter could well be one of consumers' discontent, and there will be vociferous expression of that discontent if coal supplies prove to be inadequate.

Industrial supplies are probably safe enough, but it is doubtful if the same can be said about house coal. The public "image" of coal, about which we hear so much nowadays, is largely formed (or distorted) by the householder's experience in the domestic field. That is one fact to ensure continued interest in large coal at the collieries; another is the profit which the industry derives from the house-coal trade. Adequacy of supplies of domestic grades during the coming winter is as much a matter of self-interest to the NCB as it should be to the merchant.

Passing Thoughts . . .

OUR ability to regain lost markets has been pushed even nearer to the point of no return by the very folk who urge us to export more. In precisely four months every man in my company has had tied round his neck a millstone weighing £88 representing the extra tax on the energy he uses. Roll on the day when power politicians finally acknowledge the inevitability of those laws which were not passed by Commons or Lords: one concerns supply and demand; another concerns action and reaction; they are not the concern of Ministers, but simply of all of us.—Letter in the Financial Times.

> *British steel is still cheaper than many of its competitors in Europe, as British coal is. But how long will its coastal works be able to keep this margin under similar works in Germany and now Italy, built to operate not only on imported ore but also on cheap imported coal? —The Economist.*

The time must surely arrive when it becomes apparent that exports are of such vital importance to us all that our goods must be styled particularly to attract continental buyers with we ourselves accepting the residue on the home market. This will be in strict contrast to the present approach whereby we produce goods to suit the British consumers and attempt to sell to the "blessed foreigners" what is left over.—Letter in the Financial Times.

> *I was a Grade A mechanic in the mine with 50 years' experience under my belt, and can splice a rope as thick as your wrist with the next man; but when it comes to making a bed I am all in a heap.—W. H. C.'s Colliery Cameo in the Stoke-on-Trent Evening Sentinel.*

To relate wages to productivity in a private enterprise economy or even to try to introduce the idea in a single industry such as engineering, where after all, development is not uneven, but where there are varying degrees of modernization, is to attempt the impossible.—MR. GEORGE MIDDLETON, general secretary of the Scottish TUC, writing in the Scotsman.

> *What part of the Welfare State in industry is to be jettisoned in order that an industry can be put on its toes by joining the Common Market? Which tea break is to be given up—morning or afternoon?*—VISCOUNT HINCHINGBROOKE.

Cast Steel Tube Piles for Nuclear Power Station

The main cooling water intake structure positioned 1,000 ft. offshore at the Dungeness nuclear power station, will rely for anchorage on 12 cast steel tube piles supplied by Head Wrightson Steel Foundries, Limited, a subsidiary of Head Wrightson & Company, Limited. The tubes which measure 80 ft. in length and 30 ins. diameter are believed to be the first of their kind to be made up as castings.

Cast horizontally in high tensile steel (material to BSS 392: 1937 grade "C") in 10 ft. lengths, the tubes were tapered one thickness into another to reduce the overall weight and the sections welded together. By using this method of construction it was possible to obtain a higher tensile steel, with the additional advantage over prefabricated tubes of reduced weight and shorter delivery.

Each cast steel pile is fitted with a 4 ft. long screw, 6 ft. in diameter to form the legs of the 1,100 ton octagonal working platform, which measures some 90 ft. across and 75 ft. from base to deck level. The cast steel tube piles are contained in outer tubular casings which form an integral part of the structure. Excavation of the hollow screw piles is carried out by means of an air lift pump, and deck mounted pile screwing gear will screw the cast tube piles to a depth of about 50 ft. Each tube pile will then be filled with reinforced concrete.

Flotation tanks controlled by hydraulic jacks maintain bouyancy during screwing operations. Cathodic protection apparatus has been fitted to combat erosion and other forms of deterioration resulting from permanent submersion in sea water.

Sir Robert McAlpine & Sons, Limited, who was responsible for the design and erection and subsequent removal by sea to Dungeness, is with Head Wrightson a member of the Nuclear Power Group, Knutsford (Ches), the principal contractor for the Dungeness power station.

Marking of Imported Ball or Roller Bearings

NEW Order in Council under Section 2 of the Merchandise Marks Act, 1926, announced by the Board of Trade, provides that imported ball or roller bearings with an outside diameter of not more than 12.7 mm. must have the indication of origin printed or stamped on the wrapper or container in which the bearing is imported, sold or exposed for sale, and not on the bearing itself. The Order comes into force on November 1.

The President of the Board of Trade has not accepted the recommendation of the Standing Committee (General Merchandise) that imports of the following materials should bear an indication of origin at the time of importation and sale in the UK:—Heat insulating bricks, blocks, tiles of infusorial earths, of diatomaceous earths, of kieselguhr, of siliceous fossil meal, or of similar siliceous earth.

TEN-YEAR CONTRACT has been signed by the Kaiser Steel Corporation of America for the sale of a total of 10,000,000 long tons of iron ore to the Mitsubishi Shoji Company of Japan. Shipments will begin towards the end of next year in 50,000-ton ore vessels constructed for Mitsubishi in Japan.

Steel Deliveries Down

BUT STRONG DEMAND FROM MECHANICAL INDUSTRIES

DELIVERIES of finished steel from UK mills to using industries in the second quarter of 1961 fell to a weekly average of 342,900 tons compared with 355,500 tons in the first quarter of the year and 352,800 tons in the second quarter of 1960, according to figures given by the Iron and Steel Board. Deliveries to the mechanical engineering trades, however, were substantially higher in the first half of the year than a year ago, due to greater capital investment in home industries and increasing exports of engineering goods.

Some parts of the engineering trades, including the production of contractors' plant, were taking rather lower deliveries of steel during the course of the second quarter. Deliveries of building and structural steelwork so far this year have also been substantially higher than those of a year ago, but showed a slight fall in the second quarter compared with the first quarter.

Deliveries to the motor vehicle industry were well below the figures for last year, although there has recently been some revival following the increase in production of motor cars from the low level reached during the early part of the year. Deliveries to the shipbuilding industry registered a further increase during the second quarter.

Quarterly Figures

The following table shows the weekly average deliveries of steel (in thousands of tons) to the using industries during the second quarter of 1961 compared with recent quarters.

Industry.	1960.		1961.	
	First Quarter.	Second Quarter.	First Quarter.	Second Quarter.*
Shipbuilding and marine engineering	12.3	12.3	14.6	15.4
Coal mining	10.9	12.1	11.1	11.2
Railway rolling stock and transport	13.0	13.4	16.3	16.0
Building, industrial plant, etc.	41.6	43.2	51.7	49.0
Electrical engineering	11.6	11.3	11.2	10.5
Mechanical engineering	39.2	40.0	43.3	43.6
Motors, cycles, and aircraft	40.2	38.7	26.1	29.4
Wire and wire manufactures	25.0	25.3	22.9	22.3
Drop forgings, etc.	13.5	12.7	11.4	10.8
Bolts, nuts, rivets, etc.	5.3	4.7	5.8	4.9
Hollow-ware	14.8	15.1	14.0	12.3
Metal furniture, windows, springs, etc.	15.7	16.4	16.2	15.3
Other home consumers	10.5	10.8	10.3	10.0
Stockholding merchants	47.4	46.7	51.5	42.1
Total home deliveries	301.0	302.7	306.4	292.8
Exports by producers	54.2	50.1	49.1	50.1
Total net deliveries from UK mills	355.2	352.8	355.5	342.9

* Provisional.

Between the first and second quarters of 1961 the slight fall in deliveries has been shared among most of the products although by contrast deliveries of ferro-concrete bars are continuing to increase. Tubes and colliery arches showed some improvement from a low first quarter. Deliveries of plate, which reached a record level of 66,000 tons a week in April, 1961, have since lost ground, possibly as a result of the high level of stocks now held by users. On the other hand deliveries of sheet were increasing during the course of the second quarter following the heavy withdrawals from users' stocks in earlier months.

Detailed figures of weekly average deliveries, by product, in the second quarter of 1961, with the figure for the first quarter in parantheses, are:—Plate, 63,000 (64,500) tons; heavy rails, sleepers, and fishplates, 10,400 (10,800) tons; other heavy rolled products, 54,300 (59,100) tons; colliery arches and light rails, 8,000 (7,700) tons; wire rods and other rods and bars in coil, 27,800 (29,100) tons; ferro-concrete bars and rods, 14,000 (13,700) tons; light sections and bars, 56,900 (61,600) tons; strip, 37,800 (39,000) tons; sheet, 50,100 (51,400) tons; tinplate, terneplate, and blackplate, 20,500 (22,200) tons; tubes, pipes and fittings, 25,500 (23,800) tons; all other products, 26,300 (26,300) tons.

The United Kingdom is continuing to increase its share of the world trade in steel in spite of some recent reduction in total trade, states the board, and most types of steel have contributed to relative gains secured by British steel exports. In the first quarter of 1961, the UK's share of exports from the main exporting countries—UK, USA, ECSC (excluding inter-trading), and Japan—rose to 16.9 per cent. compared with 15.3 per cent. in the similar quarter last year.

Figures, by product, for the UK's share of exports from the main exporting countries, in the first quarter of 1961, with the figure for the same quarter in 1960 in parentheses, are:—Ingots and semis 3.6 (7.8) per cent.; plate 20.8 (18.8) per cent.; sheet, 13.3 (10.3) per cent.; section and bars, 13.5 (10.8) per cent.; wire rods, 6.9 (6.8) per cent.; rails and railway material, 35 (24) per cent.; tubes, 20.1 (20.9) per cent.; strip, 16.5 (13.2) per cent.; other, 4.8 (0.8) per cent.

US Steel Output Declines

ALTHOUGH the decline in US steel production was less marked in July, for the first seven months of 1961 it was lagging well behind 1960. Output figures for July were 8,090,000 tons against 8,551,856 tons in June. For the first seven months production was 52,948,660 tons (67,105,019 tons).

Actual production of raw steel during the week to August 14 was 1,910,000 net tons, a 3.2 per cent. increase compared with the 1,850,000 tons in the preceding week. Actual raw steel production in the current year is 56,146,000 tons (69,197,000 tons).

Coal Board to Lose Mr. H. A. Longden

AFTER a working life devoted to the coal industry, Mr. Henry Alfred Longden, chairman of the West Midlands Divisional Coal Board, and former director-general of production of the National Coal Board, is to take up the post of deputy chairman and chief executive of the Cementation Company, Limited, from October 1.

MR. H. A. LONGDEN

Lord Robens, chairman of the NCB, commenting on the appointment, said he deeply regretted the departure of Mr. Longden, but fully recognized that the terms of the appointment with Cementation were such that the NCB could not match them. Mr. Longden, who succeeded Mr. E. H. Browne as chairman of the West Midlands Division a year ago, began his mining career with Glass Houghton & Pontefract Collieries, Limited, Castleford. From 1935 to 1940 he was agent and assistant general manager of the Stanton Ironworks Company, Limited, the former owners of Silverhill Nos. 1 and 2, Teversal, Pleasley, and Bilsthorpe collieries, and from 1940 to 1947 he was mining general manager to Briggs' Collieries, Limited, Normanton, in charge of Syndale, Peckfield, and Ledston Luck collieries. In 1940 he joined the board of the Blackwell Colliery Company, Limited, and the following year became a director of Briggs' Collieries, and of the New Hucknall Colliery Company, Limited.

On nationalization Mr. Longden was appointed Area general manager, No. 8 (Castleford) Area, of the North-Eastern Divisional Coal Board, which includes the majority of the pits with which he had formerly been associated. He became production director for the division in July, 1948, and went to NCB headquarters as director-general of production in 1955.

Another Coal OMS Record for West Midlands

RECORD level in overall productivity—30.4 cwt.—was reached in July in the West Midlands Division of the National Coal Board. This represents a fractional increase on the previous month's figure. In the Cannock Chase Area, overall output per man-shift rose by nearly three quarters of a hundredweight over the record figure for May to 32.1 cwt.

The monthly saleable output of 1,158,000 tons was 2.3 per cent. higher than in July last year, with a smaller labour force. Compared with a year ago, each of the four Areas in the Division showed a substantial rise in overall productivity, amounting in the case of Cannock Chase to 13.3 per cent. and in South Staffordshire and Shropshire to 21.5 per cent.

NUM Branch Official Expelled

COMMUNIST and former branch official in the Yorkshire Area of the National Union of Mineworkers—Mr. R. Wilkinson (33), a coal-face worker at Water Haigh Colliery, Leeds—has been expelled by the Area executive council. Three other officials have been severely censured. NUM action was taken because of the part played by the officials in the Yorkshire coalfield strike in February and March which made 60,00 miners at more than 60 pits idle and caused the loss of 800,000 tons of coal.

The three who were censured, Mr. J. Kane, communist chairman of the militant Doncaster miners' panel comprising union members of 11 pits, Mr. M. Thompson, secretary of the panel, and Mr. W. Kellher, secretary of Brodsworth Main branch of the union, signed a document stating that they would not break union rules or call unofficial meetings of the panel. Mr. Kane and Mr. Kellher are candidates for the Area vice-presidency.

Stating that he would appeal against the decision "right up to national level," Mr. Wilkinson said he felt the executive's action was "a matter of finding a scapegoat" and that he had been singled out as the most militant worker in the West Yorkshire district of the coalfield.

When he returns from holiday on Monday, Mr. Wilkinson will be given his usual job. Chairman of the North-Eastern Divisional Coal Board, Mr. W. H. Sales said on Wednesday: "There will be no question of refusing him work so long as he does that work properly. I am not bound by the union's closed shop policy."

Rise in Industrial Output in June

INDEX of industrial production in June rose by one point to 123—3 points above its level in January and the same amount above its level a year ago. The rise reflects the busy state of the engineering, building, and machine tool industries, most of whose output is supplying the investment sector.

Production on the consumer goods side is less satisfactory, with durables, cars and the lighter sections of the steel industry all working at lower capacity than a year ago. The balance of these two factors is that the index of production in the first half of 1961 was only 1½ per cent. above the corresponding period a year ago. With plant which was started in 1959 and early in 1960 now coming into commission, however, a further rise in production is expected.

NEW MINIMUM standard of entry to the professional examinations of the Royal Institution of Chartered Surveyors will be increased from October 1, 1962. From that date the entrant will need General Certificate of Education passes at ordinary level in five subjects at one sitting, or in six subjects at not more than two sittings. Special provisions will be made to attract candidates with GCE passes at advanced level. Particulars of the requirements in the GCE and other certificates of equivalent standard are available from Royal Institute of Chartered Surveyors, 12, Great George Street, London, S.W.1.

Coal and the Common Market

LORD ROBENS ON "TREMENDOUS OPPORTUNITIES"

TREMENDOUS opportunities for selling coal in Europe if Britain joins the Common Market were again emphasized by Lord Robens, chairman of the National Coal Board, when he paid an informal visit to the new Kellingley Colliery, near Pontefract, on Tuesday. Kellingley is the first new pit to be built in Yorkshire for over 30 years and Lord Robens included a descent of one of the partially constructed shafts and a tour of the surface works in his visit.

Provided efficiency was right and the industry was competitive the opportunities were there, said Lord Robens, adding, "I have no reason to believe we shall not be competitive. If you look at the European seaboard from Bordeaux to the Baltic, there are a great number of power stations and industrial enterprises built on the seaboard to get raw materials cheaply.

"The British coalfields are ideally situated to push out coal from ports across a few miles of water into their ports", he said.

Natural Roadway for Coal

Having developed hydro-electricity in the Rhône Valley the French, he believed, would, over the next few years, be building power stations on the Seine—a natural roadway from British ports. The opportunities were there.

The board was not content to mine coal and then wait for customers. It was directing considerable attention to new devices to use coal efficiently and it was going all out to face the competition from oil. He expected big developments in coal production for the Yorkshire coalfield. Power station coal represented a quarter of the total production and in the next 10 years this would be increased to half the output.

The call upon electric power was so great they would need to use every avenue to produce energy. He, therefore, regarded nuclear power not as a competitor to coal but as complementary to it.

In the afternoon, Lord Robens visited the Manvers Main coal preparation plant and coke and by-products plant in the No. 3 (Rotherham) Area. He was accompanied throughout his tour by Mr. W. H. Sales, chairman of the North-Eastern Divisional Coal Board.

The following day, at the Thorncliffe (Sheffield) works of Newton, Chambers & Company, Limited, Lord Robens turned from the Common to the domestic market. After seeing developments in the control of grit emission, he said that the NCB was to campaign for more large industrial concerns to burn pulverized fuel. It would be produced in greater proportion as mechanization of the pits grew, he said.

Lord Robens also announced a new plan to provide domestic hot water heating. He said the board was to finance a scheme under which housewives could obtain partial central heating of a three-bedroomed house for 15s. a week over a period of five years.

The plan would not be affected by the Chancellor's economic measures as the board's position was clear for 1961 and 1962 and met the requirements indicated. Its borrowings were not very far in excess of its ability to finance them and he hoped the time was not far off when the board would be able to cease borrowing money and be able to finance itself.

NCB to Close Harworth Coke Ovens

BECAUSE of the difficulties in the disposal of coke and the high level of stock piling, the East Midlands Divisional Coal Board is to close its coke ovens at Harworth, near Bawtry (Yorks), it was announced on Thursday of last week, after a meeting of the Plant Consultative Committee, attended by representatives of the Coal Board and the unions.

The works produces 3,200 tons of domestic and industrial coke a week and present stocks are about 200,000 tons. The plant will be closed in stages which will probably be completed in the autumn. Harworth's 25-year-old ovens would have required renewal in the next few years.

There will be no redundancy among the 175 men employed, as many will be required to work on demolition and to handle the large stocks. All the men will be offered alternative employment in neighbouring collieries. An NCB spokeman said: "We have three plants in the East Midlands Division and it is not economic to keep them all running."

Scots Winding Enginemen Quit "Rebel" Union

PRESIDENT of the Scottish Area of the National Union of Mineworkers, Mr. Abe Moffat, claimed on Monday that more than half of the winding enginemen who recently broke away from the Scottish Colliery Enginemen, Boilermen, and Tradesmen's Association, have now rejoined. A joint appeal is now being issued to the others by the association and the NUM to whom the association is affiliated nationally.

Pending discussion of the situation by the executive committee of the Scottish Area of the NUM, miners in the Lothians withdrew at the weekend a threat to strike because of the breakaway.

RATCLIFFE'S SPRINGS, LIMITED, manufacturer of flat and spiral springs, of Rochdale (Lancs)—Agreement has been reached with Barreiros Diesel, of Madrid, for the formation of a Spanish company to be called Ratcliffe Iberica, SA, says Mr. F. S. Ratcliffe in his annual statement. The extent of the company's participation to date is £25,000 but this figure may be increased later.

Appointments

New Representatives for Bowmaker

SIX new representatives have been appointed by Bowmaker (Plant), Limited, machinery dealers, of Willenhall (Staffs). Mr. G. H. FORD, who is 32, has been appointed sales representative in Warwickshire (excluding Birmingham) and part of Gloucestershire. He was previously with the Opencast Executive of the National Coal Board and later with Turiff Construction Corporation, Limited.

MR. G. H. FORD

Mr. J. BERNHARDT (41), has been appointed sales representative in the Cheshire area, and Mr. J. A. N. COATES, who was previously assistant sales manager for a motor vehicle distributor in Sheffield, becomes representative in part of South Wales. Mr. A. E. LEWIS, who was formerly in the timber trade, is appointed representative in West Wales, and Mr. R. L. TAYLOR, who has served with J. Mowlem & Company, Limited, becomes representative in North Staffordshire.

Mr. W. S. PRYKE, formerly assistant sales manager (industrial) in the agricultural department of Gailey Roberts (E.A.), Limited, has been appointed representative covering the Eastern part of South Wales.

The Incandescent Heat Company, Limited, group of companies has appointed Mr. W. S. SINCLAIR to be manager of its Cardiff office. He has been with the company for 12 years.

Mr. J. F. SUMMERFIELD and Mr. D. G. LAMBERT have been appointed additional members of the outside sales staff of J. A. Hemming, Limited, stockholders of tools, steel strip, sheet, and silver steel, of Birmingham.

Mr. A. R. YATES has been appointed mechanical engineer, Hilton Main Colliery. Mr. Yates was assistant to the mechanical engineer (reconstruction) at Littleton Colliery from March, 1958, to January, 1961, when he took up a similar appointment at Hilton Main.

Labour manager for the last four years at the Wilton (Yorks), works of Imperial Chemical Industries, Limited, Mr. B. T. JENKINS has been appointed to the company's central labour department and takes up his new post later this year. He is succeeded by Mr. C. T. G. Blackmore, at present staff manager, who joined ICI in 1948.

Mr. NORMAN CARE has been appointed general sales manager of Aberdare Cables (Holdings), Limited, and Mr. G. J. REEVES has been appointed industrial sales manager to co-ordinate all home sales in the industrial field for the group, which includes Aberdare Cables, Limited, South Wales Switchgear, Limited, Aberdare Engineering, Limited, and the Neckar Water Softener Company, Limited.

Mr. E. T. PINKNEY, consulting chemical engineer of the Anglo-American Corporation of South Africa at the head office, Johannesburg, has been appointed consulting metallurgist (development) in Salisbury with effect from January 1, 1962. He will work in conjunction with Mr. F. H. Chapman, the corporation's consulting metallurgist in Rhodesia. Mr. C. P. A. LOUWRENS has been appointed to succeed Mr. A. H. W. Busby, the corporation's consulting mechanical engineer in Rhodesia, who is retiring on December 31.

Eimco (Great Britain), Limited, has appointed Mr. A. R. HILTON, mining projects engineer. He will advise on the application of Eimco machines for mining and civil engineering projects and will also be concerned with investigation into the requirements for and development of new equipment particularly for the development as well as the production sides of the coal-mining industry. Mr. Hilton was previously Eimco's technical representative in Lancashire and the West Midlands and he is being succeeded by Mr. A. WHITWORTH, formerly an undermanager in the No. 4 Area of the North-Western Divisional Coal Board.

Milestone in British Nuclear Power Progress

NOTABLE step in the British nuclear power programme came last week-end with the loading of uranium fuel into the reactors of Britain's first two commercial nuclear power stations at Berkeley (275 mW), where fuel-loading began on Saturday and at Bradwell (300 mW), where loading began on Monday. The two stations have been designed and constructed for the Central Electricity Generating Board by the Nuclear Power Group, the consortium which consists of the AEI-John Thompson Nuclear Energy Company, Limited, and the Nuclear Power Plant Company, Limited.

The two stations are the first to be built in this country specifically for the generation of electricity and as fuel-loading goes on, TNPG is submitting its tender—in competition with other groups—for the 550 mW nuclear power station at Oldbury-on-Severn (Glos).

Some months of running trials, both of the reactors and their connected generating plant must elapse before the stations as a whole can be connected to the national grid and enter into full commercial service.

IMPROVED ORDER POSITION AT CONSETT IRON

FOLLOWING a slight improvement in the order position at the Consett Iron Company, Limited, a number of the 600 steelworkers who were due for dismissal this week will be retained, the company said on Monday. Three weeks ago it was stated that because of a fall in orders and restriction of output in all departments, 600 men would become redundant.

The company said on Monday that in the light of new orders, and to enable it to offer competitive delivery dates, the new Hownsgill plate mill would continue to work three shifts, thus allowing a reduction in the number of men to be declared redundant.

AN AWARD of £360, free of tax, the highest since the suggestion scheme started in 1954, has been made to Mr. D. T. Morrisey, a chargehand welder at the Derby foundry of Rolls-Royce, Limited.

STEEL EXPORTS

Industry's Contribution to Balance of Payments

DESPITE severe stock and import fluctuations, injurious to steel producers, consumers, and the country alike, steel has been making a substantial contribution to the UK balance of trade. Direct exports alone, which in 1960 were worth £211,000,000, more than pay for all the imports of steelmaking materials and of steel. If account is taken of the steel content of indirect steel imports and exports, steel normally contributes a surplus of over £200,000,000 a year to the balance of trade. Even this considerably understates the industry's contribution to the economy, since much of the freight and insurance element in imports is paid in sterling.

In Steel Review the British Iron and Steel Federation's quarterly, it is shown that the relative trend of direct steel imports and exports, favourable during the post-war period, gives no indication of a downward turn so far as 1961 is concerned. Exports between the years 1948 and 1955 were at the average annual rate of 1,939,000 tons and last year reached 2,900,000 tons, after falling off from the 1957 peak of 2,823,000 tons.

Imports varied considerably from 791,000 tons average in the 1948-55 period to 371,000 tons in 1959 and 1,235,000 tons last year. Net exports of steel, therefore, averaged 1,148,000 tons in 1948-55 and 1,800,000 tons in 1956-60. In the current year they have been running at a record annual rate of 2,700,000 tons—about 3,700,000 tons in terms of ingot equivalent.

Important Indirect Trade

The important element in the steel balance of trade, the indirect trade in steel in the form of fabricated and manufactured goods such as motor vehicles, machinery, ships, and a wide range of miscellaneous metal goods and structures, shows a far less favourable trend. The total amount of finished steel estimated to have been consumed in goods for export has shown some increase since the mid-1950s. On the other hand, the estimated amount of steel contained in UK imports of manufacturers has more than doubled during this period. As a result the surplus on indirect steel trade, though still substantial, has declined from a peak of almost 3,000,000 finished tons in 1956, to less than 2,500,000 tons in 1960.

This overall deterioration contains, however, a substantial improvement in one important category—motors, cycles, and aircraft—which was more than outweighed by unfavourable trends in other categories, particularly in ships and marine engines.

It is not likely that the surplus on indirect steel trade will be higher this year than last. With imports of manufactures continuing to mount, the surplus may be smaller. The surplus on direct trade, should, as has already been indicated, improve considerably. Imports of scrap and pig-iron will be negligible, and those of ores and ferro-alloys will probably be at a similar level to that in 1960. The overall direct export surplus in 1961 is, therefore, expected to be somewhat higher than in 1959, when it was £85,000,000, and substantially higher than in the past year.

Steel Review points out that the build-up of stocks by steel consumers and merchants—now estimated at 1,400,000 ingot tons for 1960—continued at a sharply reduced rate in 1961 (about 125,000 ingot tons in the first quarter), apparently petering out in March or April. In the first half of 1960, the stockbuild had amounted to 630,000 ingot tons. The decline in the rate of stockbuild in the first half of 1961 meant a corresponding drop in demand on UK producers. On the other hand there was a reduction of about 470,000 ingot tons in steel imports.

Consumers' stock changes and steel imports have been closely related in past years. In times of rising demand consumers have increased their purchases more rapidly than their actual consumption, even at the cost of substantial higher-priced imports. Subsequently the surplus stocks thus built up have been consumed at a time when supplies could have been readily obtained from home production. In this way balance of payments has suffered unnecessarily in times of rising demand, home production has suffered unnecessarily in times of falling demand, and consumers have paid more than they need have done for the steel they consumed.

£500,000 Basic Slag Plant Nearing Completion

BUILT at a cost of £500,000, a new basic slag works is to be opened at Scunthorpe (Lincs), in the late autumn by Scottish Agricultural Industries, Limited. The new plant, says the company, will be officially opened on October 3, by the managing director of Richard Thomas & Baldwins, Limited, Mr. H. F. Spencer.

The factory will enable the company to start drawing raw materials from the new Rotor oxygen process furnace which is expected to be commissioned at the Redbourne, Scunthorpe, works of RTB, in the near future. The plant will process more than 100,000 tons of high-grade slag a year.

It incorporates slag-handling, crushing, and packaging units of the latest design with facilities for high-speed dispatch of slag in bulk or in bags. Special consideration has been given to minimizing dust, and the latest dust-collecting equipment is being installed.

The existing basic slag plant alongside the Normanby Park iron and steel plant of John Lysaght's Scunthorpe Works is being renovated and modifications made. These should be completed by the autumn.

The death occurred recently, at the age of 64, of Mr. HAROLD VINCENT DENNIS, regional sales cashier for the North-Western Divisional Coal Board.

Obituary

MR. P. L. ADAMS

IT has been learned that the death has taken place in Brisbane, Queensland, Australia, of Mr. Percy Llewellyn Adams, at one time well-known to mining students at Birmingham University. He was educated at Stamford School and Birmingham University where he graduated in mining in 1932. Before returning to the university as a Lecturer in Mining in 1943 he had held posts with the Castle Lime Company, Limited, and Morris & Shaw, Limited, owners of Birch Coppice Colliery.

After five years at the university he was appointed in 1948 Senior Lecturer in Mining at the University of Sydney. In 1953 he became superintendent of Aberdare Collieries, Queensland, and in 1956 Inspector of Mines, Queensland, and an external member of the Faculty of Engineering, Queensland University.

Shortly before his death he was appointed to a senior post in the university's Department of Mining and it had been his intention to remain in academic life.

Mr. BENJAMIN O'DOWDA, the oldest grand juryman of the Great Barmote Court for the Soke and Wapentake of Wirksworth, which has controlled the lead minings in Derbyshire on behalf of the Crown for five years, has died at the age of 85.

The death has occurred at the age of 84 of Mr. OLIVER JOHN WOOTTON, founder, some 60 years ago, of O. J. Wootton Limited, brass and aluminium founders, engineers, and hollow-ware manufacturers, of Wombourn (Staffs), and formerly of Wolverhampton.

Chairman and joint managing director of Richards Bros. & Sons, Limited, cutlery manufacturers, of Sheffield, Mr. PAUL PETER RICHARTZ, died on Monday. He was 73. Mr. Richartz founded the firm when he arrived in Sheffield in 1932 from Sollingen, Germany.

Mr. JAMES DANIEL WOLFF, senior partner in R. Wolff & Company, Limited, metal brokers and merchants, who resigned last June because of age as chairman and from the board of the Metal Market & Exchange, Company, Limited, which controls the London Metal Exchange, has died at the age of 84.

Former managing director of Cable & Wireless, Limited, and joint deputy secretary to the Ministry of Fuel and Power, Mr. JOHN INNES, died on Wednesday. He was 72. He became director of services at the Ministry in 1942 and joint deputy secretary three years later. He retired in 1947, and was associated with Cable & Wireless for the next three years.

The death has occurred at the age of 62 of Mr. G. A. JONES. For many years he was the proprietor of Kingswood Colliery, near Cannock (Staffs), which he closed two years ago when reopening an old mine in Brownhills (Staffs). Mr. Jones was a former chairman of Brownhills Urban Council and prominent in the civic and social life of the locality.

The death occurred on Thursday of last week of Mr. WILLIAM JOSEPH VICTOR WARD, chairman of the Billingham (Co. Durham), division of Imperial Chemical Industries, Limited. He was 58. Joining the firm as a research chemist in 1926 he was appointed chief technical assistant on the directorate staff in 1936. He later became hydrogeneration manager at the firm's Heysham (Lancs), works and in 1944 returned to Billingham as ammonia technical manager. Six years ago Mr. Ward was appointed chairman in succession to Dr. G. I. Higson. He was also elected to the Wilton Council of ICI.

The death took place on Tuesday of Prof. ERIC BRADSHAW, Professor of Electrical Engineering in the Faculty of Technology, Manchester University, since 1952. He gained practical experience with the British Thomson-Houston Company, Limited, at Rugby, before taking up an academic career, first at Glasgow and then at Manchester. He was chairman of the North-west centre of the Institution of Electrical Engineers in 1954-55 and was organizer and editor of the Bulletin of Electrical Engineering Education.

Boiler drum order for English Steel Forge

AN order, worth £300,000, for four boiler drums, each 84 ft. long and weighing 165 tons, for the Tilbury "B" power station, has been received by the English Steel Forge & Engineering Corporation, Limited. They will be the longest and heaviest boiler drums ever to leave Sheffield. The contract, placed by the Foster Wheeler, Limited, and John Brown Land Boilers, Limited, consortium, marks a come-back for the city's heavy forge industry.

Each boiler will be made in two parts and welded at the centre. In the past Sheffield has been famous for boiler drums forged from a single ingot, which could be nearly 300 tons in weight, but with the trend to far bigger power stations, involving bigger units of equipment, even these were not big enough. Drums of steel plate welded together, usually on site, took priority, but by combining advanced welding techniques with traditional forging methods, Sheffield's heavy forge industry aims to recapture lost markets.

The drums are due to be supplied over the next three years and will be transported by rail on two wagons "strapped" together.

Redundancy at Steel, Peech & Tozer Works

BECAUSE of the need to keep ingots stocks from getting out of hand, several furnaces at the Rotherham works of Steel, Peech & Tozer, branch of the United Steel Companies, Limited, are to be taken off and 100 men were told on Monday that their jobs would finish next week. The number of open-hearth furnaces in operation in the Templeborough melting shop is being reduced from 12 to 10 and in the Rotherham melting shop to three—probably falling still further to two. In this shop four or five were in operation.

The need to keep ingot stocks from rising is because neither the Morgan mill (narrow strip), nor the Brinsworth mill (medium strip), are working to capacity, and the railway tyre and wheel mills have been "depressed" for some time. "As trade is not picking up significantly, there is no point in adding to stocks of ingots," a company official commented.

NEW CUPOLA furnace was put into operation on Tuesday at the Chapeltown works, near Sheffield, of F. Parramore & Sons (1924), Limited. The furnace was tapped for the first time by the chairman of the company, 74-year-old Mr. Alfred Parramore.

Steel Foundry Conditions

DUST ELIMINATION AND ACCIDENT PREVENTION

IN its first report, published on Monday, the Joint Standing Committee on Conditions in Steel Foundries urges a higher standard of "good housekeeping" in steel foundries in Britain to deal with the elimination of dust and to bring about a substantial reduction in accidents. The committee, which reports to Mr. T. W. McCullough, Chief Inspector of Factories, was set up in 1952 "to keep under review conditions and developments in the industry affecting the health, safety, and welfare of persons employed."

The major part of the report is devoted to the prevention of industrial diseases in steel foundries by the elimination, suppression, or control of dust and fumes. Dealing with elimination, the committee urges a high standard of ventilation and suggests that, where possible, dusty work should be segregated in time—for example, by working at night so that the dust would be produced when the smallest number of men would be in the foundry to breathe it.

It finds that many foundries are still in need of a much higher standard of "good housekeeping" and is convinced that even the best foundries cannot afford to ignore this aspect of the matter, involving as it does everybody in the foundry and demanding the wholehearted co-operation of management and men.

Need for Immediate Action

Suitable methods of dust control for the varying circumstances of the industry were examined in detail and at length and the report discusses existing methods, such as the use of vacuum cleaners, water, blasting techniques, and local exhaust ventilation. It is urged that suitable protective methods should be selected from the variety now available and applied by every foundry at once with "a sense of responsibility which will ensure that these new devices will be installed and worked to the highest possible standard by men and management together."

Having examined the industry's accident statistics during the period 1953-1956, the committee considers that the yearly totals could be very substantially reduced by a determined attack on the principal causation groups.

Its main recommendations in this field are:—A higher standard of housekeeping, especially about the provision and maintenance of better floors and gangways with particular attention to obstructions, permanent and temporary, on such floors and gangways; wider provision of suitable protective clothing and other protective devices; the proper care and use of such equipment by workpeople.

Early first aid should be available for all injuries, and there should be better instruction in safe methods and practices in manual weight lifting, and also in the handling of loads by cranes and other hoisting appliances.

MANUFACTURERS OF telephones and mine-signalling equipment, A. T. & E. (Wigan), Limited, is to extend its Pemberton (Lancs). factory.

Steel Industry Profits Rise 21·7 Per Cent.

PROFITS in the iron and steel industry in the first seven months of the year rose by 21.7 per cent. compared with the same period last year—one of the largest percentage increases shown by an industrial group. Despite this, the rate of growth of business profits and dividends generally is still slowing down, according to company reports published in July. The 233 industrial companies which reported last month showed an increase in profits of only 5.8 per cent. compared with the rise of 10.7 per cent. shown by the 1,328 companies which reported in the first half of the year.

As a result of disproportionate increases in provisions for depreciation and taxation, earnings in July were actually down 3.1 per cent. against an increase of 12.1 per cent. in the first six months. Net ordinary dividends paid by the July companies increased by 9.3 per cent., compared with the 15.2 per cent. rise for the companies reporting in the first six months. Among industrial groups reporting lower profits was shipbuilding, whose earnings were down by 4 per cent.

C. A. Parsons Opens New London Offices

NEW London offices at 40, Broadway, S.W.1, opened by C. A. Parsons & Company, Limited, double the space previously available and are complementary to developments at the company's Heaton Works, Newcastle-upon-Tyne, where a large nuclear research station and a new mechanical research laboratory have been installed.

Contracts in hand at the Heaton Works for turbo-generators include four machines of 500,000 kW, two of 200,000 kW, and one of 550,000 kW for the Central Electricity Generating Board, a 500,000 kW generator for the Tennessee Valley Authority, and four machines of 200,000 kW and two of 300,000 kW for Ontario. Besides several units ranging from 5,000 kW to 120,000 kW, C. A. Parsons also has in course of manufacture what are believed to be the largest blast-furnace turbo blowers in the world, for Richard Thomas & Baldwins, Limited.

London manager of C. A. Parsons & Company, Limited, is Mr. G. A. S. Bartley.

Law Cases

£1,500 CLAIM FAILS

AT the Court of Session, former Fife mine manager, Mr. Walter William Scott, who had two ribs and a shoulder broken nearly five years ago as the result of a roof fall at Torry Mine, Newmills (Fife), lost his £1,500 damages claim against the NCB.

In his judgment Lord Migdale absolved the Coal Board from blame and said that Mr. Scott had established that the board was in breach of its legal obligations, but he had failed to prove that this had caused or contributed to the accident.

MINER'S £7,750 DAMAGES

DAMAGES and costs amounting to £7,750 were awarded at Leeds Assizes against the National Coal Board, to John Stanley Sissons (54), who lost his left leg after an accident at Peckfield Colliery, Micklefield (Yorks), in October, 1956, while operating a coal-cutting machine.

Giving judgment, Mr. Justice Jones said the NCB was in breach of its statutory duty in having failed to make the coal face secure.

MINER'S £400 CLAIM

JUDGMENT was deferred for a month at Rotherham County Court on a claim by a miner, Mr. Robert Sinclair Campbell (24), for £400 damages against the National Coal Board. Mr. Campbell was stated to have been struck in the face by a haulage rope while bending down to remove a piece of belting which might have obstructed coal tubs.

Mr. A. W. Lyon, for Campbell, said it was claimed that tension on the haulage rope between the end of the track and a wing rail, became so great that the rope pulled out from a junction box, acted like a catapult and lashed about. The suggestion was that it was a dangerous manœuvre for a rope to be left in a junction box to allow for the removal of tubs from one track to another.

Mr. G. Milner, for the NCB, said he was bound to concede that the rope did not get into the junction box accidentally. He would be prepared to say, therefore, that if the rope was in the junction box it was placed there by some employee of the board.

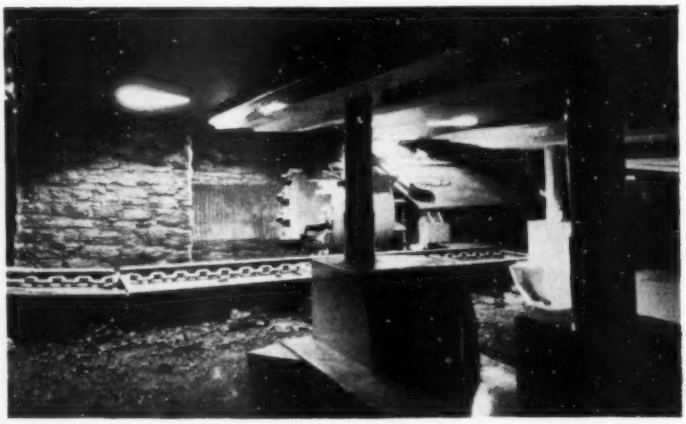
JUDGMENT IN A £400 claim for damages, brought by Mr. Henry Evans (62), a ripper, against the National Coal Board at Rotherham County Court was deferred by Judge W. A. B. Goss, after a hearing lasting six hours. Mr. Evans was said to have received a foot injury in a roof fall at a main gate in the Haigh Moor seam at Manvers Main Colliery, near Rotherham, in December, 1959.

SGB Concludes Two Agreements

AN agreement has been concluded between Scaffolding (Great Britain), Limited, and Hico Export, AG, of Zurich, whereby from Tuesday SGB is now the sole licensee for the manufacture and marketing of the full range of Hico centering equipment in Great Britain, Northern Ireland, Eire, Argentina, Australia, Federation of Rhodesia, Ghana, Kenya, Pakistan, Mauritius, New Zealand, Sierra Leone, Turkey, and the Republic of South Africa.

Another agreement has been concluded between Scaffolding (Great Britain) and Blaw Knox, Limited, under which SGB will be the sole manufacturers of Blaw Knox shuttering equipment. This follows the rationalization policy of Blaw Knox whereby it is now concentrating on the production of the heavier types of construction equipment and machinery.

Mining by Remote Control in London



EVEN on holiday, it seems, miners cannot keep away from the pit. At the National Coal Board's stand at the Boys and Girls Exhibition at Olympia, London, this week, a reconstruction of a modern coalface operated by remote control has been on display to up to 9,000 visitors a day—and not all of them children. Said an official: "There have been so many visiting miners here, it's a wonder the pits keep going."

The mock coal face includes a power loader, powered roof supports and conveyor, automatically operated from a control panel outside. A closed circuit television camera at the face throws a picture onto a monitoring screen alongside the control panel, enabling the operator to see all that happens at the face. Several children have, to their delight, been allowed to work the controls.

A scraper chain coal conveyor, an Anderson Boyes trepanner, and four of the series of Roofmaster hydraulic roof supports are all operated electrically from the control panel. A running commentary is given as the sequence of operations is carried out.

Around the stand there are illustrated panels describing careers in coal, photographs of modern collieries, and working models of the Bretby tunnelling machine, Anhaubel coal plough, Anderton shearer, and scraper box plough.

Commented one retired miner, after watching the machinery being operated by mining trainees from the East Midlands and other coalfields: "Things are very different than they were in my day."

A FULL-SCALE TRIAL OF

The LD Process at Consett

by T. F. PEARSON, M.Sc., F.I.M.

(Consett Iron Company, Limited)

This article gives details of the conversion of a 30-ton acid-lined bottom-blown converter (normally used for duplexing in conjunction with an open-hearth plant) to a basic-lined vessel. Modifications to the converter stack enabled blowing by means of a vertical oxygen lance to be carried out. A total of 23 blows on a full scale was conducted, the product of each cast (with one exception) being a low-carbon rimming steel.

RECORDS are given of the conduct of the blows and the results obtained and a discussion of the various features encountered follows. The project, carried out by the research department of the Consett Iron Company, Limited, was designed to secure first-hand knowledge of the LD process under " domestic " conditions and to supplement information already available. These experiments constitute the first full-scale trial of the process in Britain.

INTRODUCTION

Much has been written on oxygen steelmaking, and its literature may be divided into two classes—original papers describing development work carried out, and reviews or attempted critical surveys which often contain fewer facts and more points of view. Such literature, inseparable from the development of a new process which has made such rapid strides, does not necessarily facilitate clear-cut decisions with respect to its adoption and the wisest course is to obtain evidence from actual trials using one's own raw materials.

This course has been taken by the company. Not only have trials been carried out in both Kaldo and LD vessels in Sweden and Austria, respectively, using iron from Consett's blast furnaces, but it was also decided to supplement the information obtained with that from its own trials of the LD process.

While it has been decided to install both processes, the experiments presently described were helpful in increasing confidence in the suitability of the LD process for the rapid production of soft rimming steels from iron containing phosphorus in excess of that associated with the majority of existing LD plants.

The recession in the demand for steel during 1958 and 1959, when extra output obtainable by duplexing was not needed by the company, presented an opportunity to change over one of the two 30-ton acid-lined converters for a trial of the process. An examination of the plant indicated the possibility of adapting a vessel suitably to accommodate a vertical axial lance at a reasonable cost. " Tonnage " oxygen was also available.

Modifications to the Plant

The converters have their trunnion centres outside the exhaust chimneys (Fig. 1) and are electrically driven from a control house situated on the opposite side of the pouring bay.

Metal, after blowing, is poured from the converters towards the pitside into a ladle on an electrically driven transfer car operating along the centre line of each converter for the full width of the bay and beyond into the casting bay of the open-hearth plant. Here it is lifted for charging into the open-hearth furnaces by the casting-bay cranes. The transfer car tracks are continued in the opposite direction under the vessels and into a stockbay, which contains bottom-making and drying equipment (Fig. 2). Clearance under the vessels in a fully inverted position permits the passage of a slag ladle for draining purposes. From Fig. 1 it is seen that the vessels are provided with a " back " stage from which the sealing of bad tuyeres can be done. This stage is directly under the exhaust chimneys.

To move a converter underneath the vertical chimney would have been too costly. It was decided therefore to remove the inclined nose of one vessel and substitute a symmetrical nose (of the same diameter opening), so permitting the use of a vertical axial oxygen lance. To avoid ejection of fumes from this vertical nose into the bay, a steel hood of welded construction (Fig. 2) was built and hung on brackets fixed to the face columns on either side of the existing chimney opening.

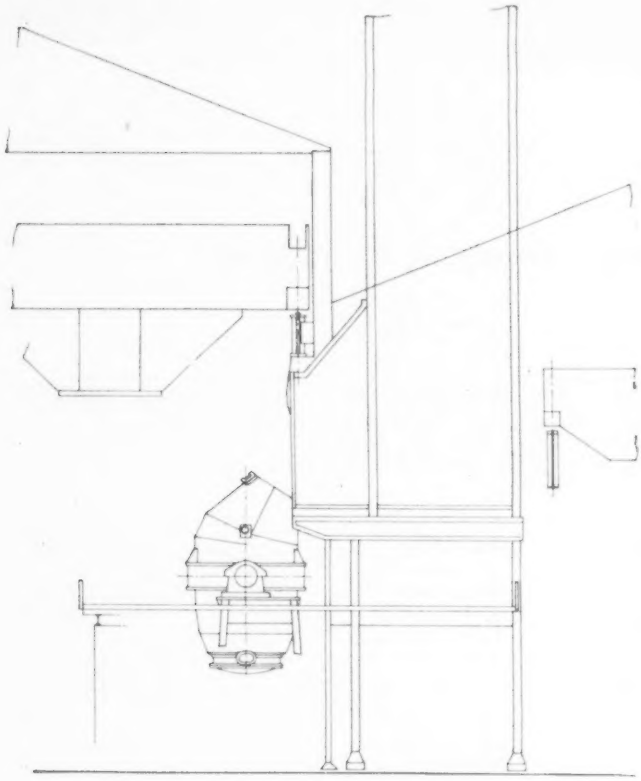


FIG. 1.—CONVERTER AND EXHAUST CHIMNEY.

The centre of the hood incorporated a "box" to allow the lance head to travel to as low a position as possible and to provide clearance for water and oxygen connections.

The hood was lined internally with flat 1-ft. sq. fireclay tiles 3 in. thick. Each tile was fastened with a headed steel pin, the head fitting into a recess in the centre of the tile, and passing through the tile and through a suitably spaced hole in the hood. Wedge cotters driven through slots in the projecting pin ends retained each tile tight against the underside and sidewalls. The hood served extremely well in spite of its close proximity to the nose of the converter. A tubular water-cooled lining to the hood would have been preferable because a few tiles on the bottom of the "box" had to be replaced occasionally due to fracture which was caused by slag penetration and repeated heating and cooling.

The lance was raised and lowered by means of a cable and jib directly above and an electric winch. The winch was operated by a push-button control placed in a new station adjacent to the converter (Fig. 2). Because experience in both Sweden and Austria had shown the desirability of having all controls adjacent to the vessel itself, the converter and transfer car controls were removed from their previous position and incorporated in the new station. An armour plate-glass window allowed full sighting of the converter nose by the operator while tilting, pouring, or making additions from a chute.

Water and oxygen connections, being external to the hood and chimney, were reasonably well protected. The arrangement had, however, one disadvantage in that the nearest approach of the nozzle to the surface of the bath was limited by the length of the lance. This length was, in turn, determined by the distance available between the top of the converter and the jib pulley. The position of this pulley had to be sufficiently low to clear the underside of the bridge of the overhead crane used for filling the converters. These circumstances determined the nearest approach of the lance nozzle to the calculated bath level to be 5 ft. 6 in. In the Austrian trials distances between 4 ft. 3 in. and 5 ft. 6 in. were used during different heats.

It was decided to sample and pour on the existing stage side, *i.e.*, underneath the vertical chimney. To afford protection while sampling, the converter mouth could be partially covered by sliding sheets, which were movable horizontally on either side of the centre line of the converter.

It was also decided to use the original floor of the chimney as a charging platform for fluxes and scrap. A protective roof became necessary and the front of the chimney, between these two levels, was closed by a firebrick wall through which a chute projected. The new roof was covered with crushed loose slag as an insulator and the chute was provided with a door so that materials could be pre-charged in weighed quantities to save time. The "solids" charging platform was provided with a weighing machine and fed by bucket and motorized hoist block, which ran on a monorail projecting into the stockbay.

The transfer car carrying the steel ladle was coupled to a slag ladle by a rigid distance bar so that both ladles could be moved simultaneously by the transfer car control. When the slag ladle was in position under the fully inverted converter to receive slag after pouring the steel, the steel ladle was then in a position clear of the converter and so could be lifted by the casting-bay crane for teeming. Teeming was done from a temporary stage made from an old crane bridge mounted parallel to a rail track carrying moulds on bogies. The pitside crane was used for charging liquid metal to the converter as in duplex practice.

These experimental arrangements worked very well considering their "temporary" nature and there were no serious incidents. The worst inconveniences were joint leakages and, on one occasion, the bursting of the flexible tubing conveying oxygen to the lance. Unfortunately, armoured rubber-asbestos hose had to be used, owing to the inability to secure metallic bellows tubing in time.

Some leakage of fume into the pitside occurred initially along the top edge of the hood, but this was successfully stemmed after the first blow. In no case was a blow abandoned, although "delays" did occur (Table 1). The modified chimney proved entirely adequate and no fume reached the shop from the lower edges of the hood. It was, indeed, possible to stand at the back of the new floor in the chimney while blowing proceeded, because the exhaust gases "hugged" the front of the chimney closely.

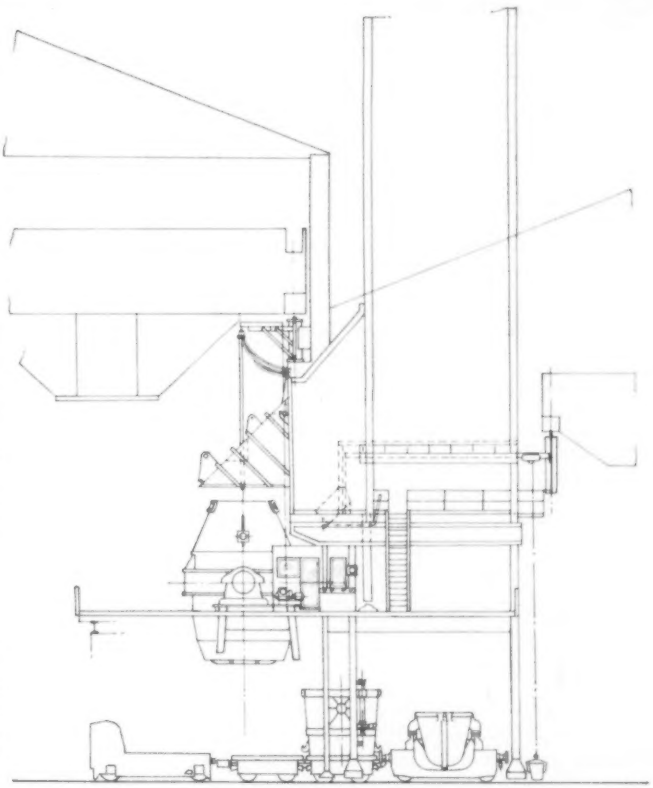


FIG. 2.—CONVERTER AND EXHAUST CHIMNEY SHOWING MODIFIED CONVERTER BOTTOM AND NOSE, LANCE EQUIPMENT, AND ADDITION OF HOOD TO CHIMNEY.

Details of the Oxygen Lance

The lance was constructed from seamless steel tubing and terminated in a copper nozzle of convergent/divergent shape. The minimum internal diameter was 1⅛ in., enlarged towards the exit to 1¼ in. dia. (Fig. 3). The nozzle was designed to give the highest possible velocity at a flow rate of 2,000 cu. ft./min. with the oxygen line pressure available (120-130 lb./sq. in.). The lance was 19 ft. 10 in. long and, because the nozzle could not, as previously noted, approach nearer than 5 ft. 6 in. to the bath, it appeared essential to secure as high a velocity as possible (rather than volume). During some blows full line pressure was not available because prior open-hearth consumption from the same main fluctuated. Pressure at the converter sometimes fell to 90 lb./sq. in.

The lance was designed for a cooling water-flow rate of 100 gal./min. and the cross-sectional area of the nozzle water space was designed to give a velocity in excess of 15 ft./sec. which is considered the minimum necessary for effective cooling. Because of the height of the lance in relation to the water-supply system, it was found by measurement that only 40 gal./min. could be passed. Also, the ingoing water temperature was 40 deg. C. having been used previously for open-hearth furnace cooling. This resulted in an excessive temperature rise during a preliminary blow of liquid metal used to complete the "burning in" of the lining and a leak developed at the nozzle joint.

To remedy this a 3-h.p. Mono pump was installed between the water main from the open-hearth shop and the lance. This achieved the designed flow of 100 gal./min. through the lance and, in spite of the ingoing temperature being high (resulting in occasional rises to 90 deg. C. during blows), no further trouble was encountered.

The theoretical issuing velocity at the nozzle was designed to exceed 2,000 ft./sec. when passing 2,000 cu. ft./min. While this exceeds sonic velocity, the fact that the experiments were run, in most instances, at 1,200 to 1,500 cu. ft./min. lowered this theoretical velocity considerably. It is unlikely, therefore, under working conditions, that there was much, if any, penetration of the metal below the slag by the oxygen, particularly at the distance involved and with the inevitable divergence from a rod-like jet which would occur.

Results obtained therefore indicate that penetration of the metal is not a necessity *per se* for the production of steel by the process. It appears probable that the rate of supply of oxygen is more important and the oxygen rates obtained in the

TABLE 1.—*Records of Principal Quantities and Times Involved.*

Blow No.	Pig-iron.	Lime.	Oxide.	Scrap.	Fluor-spar.	Active blowing time.	Total time commence charge/tap.	Total oxygen.	Oxygen per ton metallics charged.	Oxygen press.	Remarks.
	Tons Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Min.	Hr. Min.	Cu. ft.	Cu. ft.	Lb/sq.in.	
L.O. 1 ..	23 17	43	5.3	—	—	69	3 16	113,200	4,717	90	Excessive time due to burst O_2 tubing—repaired during heat.
2 ..	23 18	46	4	—	—	47	1 47	75,120	3,130	90–57	
3 ..	28 4	50	3	—	—	48	1 50	77,040	2,727	90	
4 ..	28 3	50	3	—	—	48½	2 02	79,440	2,817	90	Heavy foaming.
5 ..	26 6	48	1	—	1.5	50½	2 22	82,680	3,144	90–30	Heavy foaming and ejections of metal.
6 ..	24 19	44	6	—	—	41	1 38	70,680	2,816	90	
7 ..	28 6	50	3	—	0.25	46	1 38	75,240	2,654	90–67	O_2 line pressure very variable first 11 min.
8 ..	31 10	52	7	—	—	52½	1 47	89,280	2,816	90–75	
9 ..	24 19	45	8	—	—	37	1 15	61,920	2,462	90	
10 ..	28 19	58	2	—	—	41½	1 17	68,760	2,371	90	A little slag taken off because of high-phosphorus iron.
11 ..	29 10	55	—	—	2.0	44	1 54	78,600	2,664	90	A little slag taken off because of high-phosphorus iron.
12 ..	29 0	53	—	—	1.5	41	1 45	74,160	2,557	98	
13 ..	28 12	50	6	—	1.0	42	1 50	70,200	2,455	98–90	
14 ..	29 13	53	4	—	2.0	46	1 42	78,240	2,639	90–85	
15 ..	30 0	52	4	—	2.5	45	1 45	73,200	2,428	95–90	
16 ..	29 15	51	9	—	0.5	43	1 46	70,760	2,378	95	
17 ..	30 5	56	2	1	2.0	52	1 38	85,200	2,811	95	
18 ..	31 0	48	—	13	1.0	54½	1 45	87,560	2,767	95	
19 ..	28 13	50	2	14	1.0	48	1 38	75,600	2,574	95	Delay due to protective sheeting failing.
20 ..	30 14	52	12	16	0.5	45	1 29	69,960	2,207	95–90	
21 ..	29 5	51	4	—	1.5	47	1 23	77,400	2,637	90	
22 ..	39 9	56	—	12	0.5	72½	2 27	82,260	2,647	90	Heavy foaming.
23 ..	30 4	55	5	20	—	61½	2 11	85,440	2,730	90	Heavy foaming.

NOTE.—Overall average oxygen consumption per ton metallics charged = 2,725 cu. ft.

present experiments being lower than those used in vessels of the same capacity elsewhere, explain partially the somewhat slower steelmaking rates and lower oxygen "efficiency."

Lining and Preparation of the Converter

It was decided, for the present experiments, to ram the converter body with tarred dolomite, using a wooden former, instead of using magnesite bricks or dolomite blocks. It was also decided to line the vessel, *in situ*, in an inverted position, contrary to normal practice, which involves removal of the shell from the trunnion ring for relining on the shop floor. The reason for the change was to avoid possible damage to new ramming which might result from lifting and refitting in place.

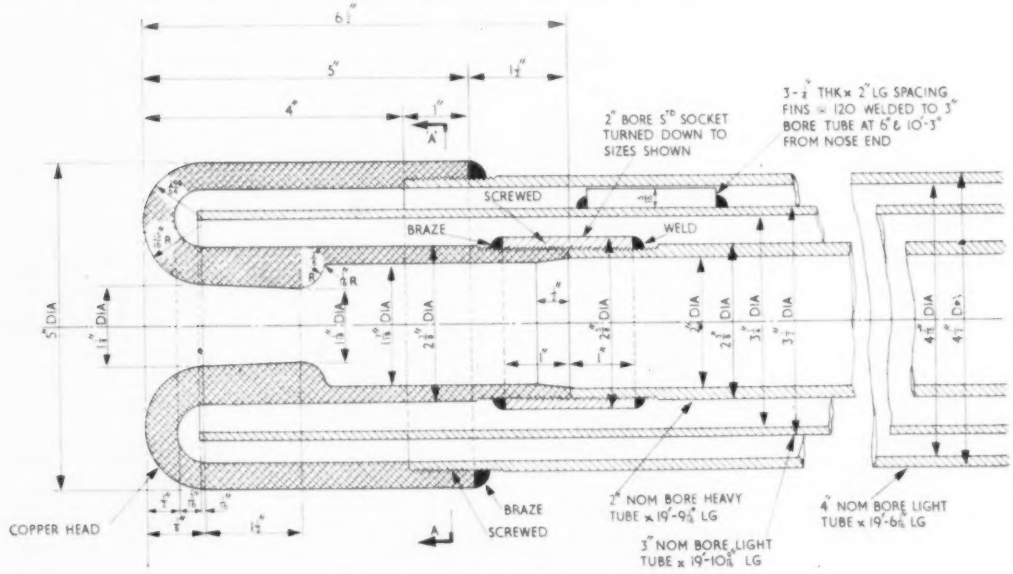


FIG. 3.—DETAILS OF OXYGEN LANCE.

The inverted position also simplified ramming of the nose cone and ensured maximum consolidation in this vicinity by the superimposed weight of the full lining. No safety lining was used, the dolomite being rammed between shell and former to give a 15-in. thickness. The bottom was bricked to half its depth and completed with rammed Consett MR2 magnesite mix. The windbox was omitted, a flat steel plate being substituted.

After ramming, the formers were removed and the vessel rotated to the upright position. The bottom was then attached by jack-car in the usual way, the joint being sealed with fine tarry dolomite. Burning-in the lining was not achieved in one operation because shift working was not adopted. Initial heating was by a wood fire, followed by coke and using a slow stream of oxygen. This was followed by charging 20 tons of direct metal, which was partially blown as for duplexing and then transferred to an open-hearth furnace. In spite of apparently high surface temperatures developed by this preliminary blow, after emptying, two small kidneys of metal had formed under the trunnions. The vessel was otherwise clean, although some surface flaking had taken place.

The estimated weight of these skulls was 15/20 cwt. each and these could be taken into account by considering a number of charges collectively for the purpose of calculating yield subsequently without interfering significantly with accuracy.

Conduct of the Blows

It was known that the time available for the trials was limited and, consequently, the adjacent 850-ton mixer was not used. Direct iron was weighed into the converter by decanting from the blast-furnace ladle into a transfer ladle on the mixer weighbridge. It was decided to strip ingots in the pitside so that this weighbridge could be used for determining ingot weights, together with scrap and any skulls produced. Three 40-ton transfer ladles normally used for duplexing were converted to teeming ladles.

The general pattern of the experiments was governed by the following considerations, some of which were influenced by the results of the trials carried out for Consett abroad.

Objectives

Whereas the trials abroad had been conducted with an iron of substantially constant analysis, *viz.*, 0.8 per cent. Si, 0.65 per cent. P, the iron now available varied from 0.7 to 1.1 per cent Si, with 0.3 to 0.6 per cent. P. Would variations of this order present difficulties with respect to control? Also, severe foaming had been encountered previously, with considerable loss of metal from some charges. This phenomenon is by no means fully understood and any information on it is useful. Again, a more detailed study of metal and slag changes would be possible, since sampling could be done as desired without consideration of time.

The experiments would also provide a useful introduction of the process to personnel who might be employed later on a production plant, and actual manipulation of the process is more valuable than any observations, however thorough. To this end, therefore, a willing crew drawn from men who normally operated the " Bessemer shop " were recruited, with additional personnel from the research department.

Working Times

In spite of the limited period available, continuous working was not adopted, so that intervals between trials could be used for a consideration and discussion of previously obtained results. There were also limitations in the availability of direct metal. Lower than desirable oxygen pressures and the lance distance also precluded any possibility of achieving maximum production rates.

Product

It was decided to produce an ordinary rimming steel of percentage analysis:—0.08 to 0.13 C, 0.35/0.50 Mn, 0.05 S, and 0.05 P. This is a specification used for many general purposes and C below the lower limit is usually not objected to by users. To achieve higher carbon levels would have complicated the problem of steelmaking by this process considerably and immediate resources were not adequate for the rapid analyses which would have been necessary.

TABLE 2.—*Tapping Slag Percentage Analyses.*

Blow No.	SiO_2	FeO	Fe_2O_3	MnO	P_2O_5	CaO	MgO	Total Fe	Al_2O_3	TiO_2	Cr_2O_3	V_2O_5
L.O. 1 ..	9.4	25.1	9.3	2.5	5.25	33.6	11.0	26.0	1.2	0.70	1.56	0.23
L.O. 2 ..	12.7	26.4	5.7	4.0	5.3	35.8	6.1	23.8	0.64	1.15	1.62	0.55
L.O. 3 ..	17.0	16.4	5.1	3.8	5.9	43.6	3.8	16.3	0.80	0.70	1.48	1.08
L.O. 4 ..	16.8	11.7	5.3	3.7	5.9	45.3	6.9	12.8	0.75	0.53	1.78	1.20
L.O. 5 ..	8.3	34.2	8.3	2.5	3.2	33.4	7.0	32.4	N.D.	N.D.	N.D.	N.D.
L.O. 6 ..	15.6	16.1	5.9	4.1	5.5	42.6	6.6	16.6	"	"	"	"
L.O. 7 ..	15.3	15.9	8.9	3.5	4.9	42.0	5.0	18.5	"	"	"	"
L.O. 8 ..	16.8	12.8	7.0	3.6	4.7	43.8	6.3	14.8	"	"	"	"
L.O. 9 ..	17.2	9.9	4.7	3.3	5.0	49.2	5.7	11.0	"	"	"	"
L.O. 10 ..	18.8	7.7	4.9	4.1	7.5	50.1	3.7	9.4	"	"	"	"
L.O. 11 ..	10.7	17.3	7.9	2.8	8.8	43.2	4.7	18.9	"	"	"	"
L.O. 12 ..	12.2	18.7	6.1	3.9	5.7	44.4	5.0	18.8	"	"	"	"
L.O. 13 ..	13.4	13.9	9.6	3.5	5.6	43.0	5.4	17.5	"	"	"	"
L.O. 14 ..	14.4	14.4	6.3	3.1	4.6	45.6	6.2	15.6	"	"	"	"
L.O. 15 ..	14.1	10.7	7.3	3.7	6.0	47.6	5.2	13.4	"	"	"	"
L.O. 16 ..	13.8	16.5	6.1	3.3	5.1	44.4	6.0	17.1	"	"	"	"
L.O. 17 ..	12.8	15.9	5.6	3.5	5.0	46.0	6.8	16.2	"	"	"	"
L.O. 18 ..	15.0	15.2	5.6	4.1	4.9	43.8	6.9	15.7	"	"	"	"
L.O. 19 ..	13.2	16.1	6.9	3.7	4.1	44.8	7.3	17.3	"	"	"	"
L.O. 20 ..	14.4	10.7	5.9	3.1	4.6	50.0	6.5	12.4	"	"	"	"
L.O. 21 ..	11.0	15.0	12.4	3.0	4.4	42.0	8.4	20.3	"	"	"	"
L.O. 22 ..	8.2	23.0	8.0	2.8	2.9	40.0	10.0	23.3	"	"	"	"
L.O. 23 ..	6.9	26.8	6.9	2.1	2.1	37.4	13.3	25.5	"	"	"	"

TABLE 3.—*Analyses of Iron Used and Pit Sample Analyses.*

Blow No.	Hot-metal percentage analyses.				Pit sample percentage analyses.			
	Si.	S.	P.	Mn.	C.	S.	P.	Mn.
L.O. 1 ..	0.85	0.023	0.44	0.64	0.055	0.038	0.012	0.30
2 ..	0.94	0.037	0.49	0.59	0.070	0.040	0.024	0.27
3 ..	1.13	0.039	0.34	0.59	0.080	0.037	0.038	0.45
4 ..	1.03	0.044	0.35	0.55	0.210	0.038	0.040	0.58
5 ..	1.13	0.034	0.36	0.57	0.070	0.023	0.011	0.34
6 ..	1.08	0.039	0.42	0.58	0.090	0.035	0.021	0.28
7 ..	0.71	0.057	0.53	0.50	0.100	0.051	0.026	0.35
8 ..	0.89	0.049	0.30	0.50	0.085	0.047	0.035	0.35
9 ..	0.89	0.049	0.30	0.41	0.100	0.040	0.039	0.47
10 ..	0.75	0.057	0.57	0.45	0.110	0.054	0.115	0.41
11 ..	0.80	0.065	0.60	0.45	0.095	0.037	0.019	0.26
12 ..	0.85	0.052	0.41	0.58	0.090	0.028	0.019	0.35
13 ..	1.03	0.035	0.36	0.47	0.090	0.034	0.021	0.30
14 ..	1.03	0.035	0.36	0.47	0.080	0.026	0.021	0.22
15 ..	0.80	0.046	0.43	0.63	0.090	0.029	0.024	0.39
16 ..	0.80	0.046	0.43	0.63	0.065	0.031	0.027	0.31
	0.85	0.025	0.36	0.47				
17 ..	1.08	0.022	0.39	0.68	0.080	0.018	0.021	0.35
18 ..	1.08	0.022	0.39	0.68	0.085	0.020	0.042	0.44
19 ..	1.08	0.022	0.39	0.68	0.070	0.018	0.021	0.34
20 ..	0.99	0.033	0.39	0.61	0.105	0.024	0.022	0.35
21 ..	0.99	0.047	0.38	0.53	0.085	0.017	0.015	0.39
22 ..	0.94	0.045	0.41	0.61	0.090	0.018	0.015	0.39
23 ..	1.13	0.042	0.38	0.48	0.105	0.017	0.015	0.24

Method of Steelmaking and its Control

Since the product intended is low in carbon, it was decided that if sufficient lime was charged to satisfy the requirements of the Si and P to produce a final slag, known from experience to be of sufficient basicity and oxidizing power, then the metal must be sufficiently low in P to be acceptable for the chosen specification. If this be true then metal sampling and analysis as a means of control become unnecessary. Following these experiments it has been learned that at least one plant in America operates on this basis, but using time and oxygen volume as the "controls." Under conditions of correct basicity the only controlling factor is the oxidizing power of the slag for which the simplest (though crude) measure is its "total Fe" content.

This is an advantage because the analysis of a slag for total Fe can be speedier than the analysis of a metal sample. Provision was therefore made on the stage near the converter for the analysis of slags for "total Fe" and all charges were tapped on "Fe in slag" values, together with an assessment of its appearance. This has been reasonably successful as seen from Tables 2 and 3, with one exception which is referred to later.

The charging method adopted was to add first to the converter 25 cwt. of lime. This was followed by the hot metal and a 10-min. blow was given. At the end of this period the remainder of the calculated lime quantity was added and blowing then continued. During the blows, metal and slag samples were taken at intervals, the former being for subsequent analysis and study. Depending on the change in appearance of the slags (and the determined "Fe" content), more lime was added at intervals during some blows. These additional quantities, *i.e.*, 1 or 2 cwt., were small in relation to the initially charged lime.

Before charges were poured into the ladle a lime dam, usually 2 to 3 cwt. was built at the converter mouth. This dam was pierced with a wooden pole while tilting to pour and, provided a short interval was allowed for slag to chill at the lip, proved very effective in preventing slag leaving the vessel simultaneously with the metal. Indeed, several pours resulted in bare metal in the ladle necessitating the addition of a lime cover to prevent undue cooling during teeming. Tapping slags were sampled before the addition of this lime. Ferro-manganese and anthracite (to some charges) were added during pouring. The steel was teemed through 1½-in. fireclay nozzles into square moulds to make 10-ton ingots for billet manufacture.

Discussion of Results Obtained

The numerical data and results obtained are given in Tables 1 to 5 and Figs. 4 to 9. Discussion of these is attempted collectively with references to particular characteristics in some charges.

Appearance of the Blows

The volumes of gases evolved are much less than those from an air-blown converter, due to the absence of nitrogen. Fume evolution is "lazy and rolling." In the very early stages the fume is purple-brown in colour. As blowing progresses up to about 60 per cent. of the total time during

TABLE 4.—*Metallic Yields Obtained from the First 11 Blows.*

Blow No.	Pig-iron.		Oxide (met. eqv.).	Total metal.		Yield, ingots + scrap.	
	Tons	Cwt.	Cwt.	Tons	Cwt.	Tons	Cwt.
L.O. 1..	23	17	3.25	24	0.25	24	5.25
2..	23	18	2.5	24	0.5	20	18
3..	28	4	1.8	28	6	22	2
4..	28	3	1.8	28	4.8	29	14
*5..	26	6	0.6	26	6.6	15	14
6..	24	19	3.6	25	2.6	23	14
7..	28	6	1.8	28	7.8	22	11
8..	31	10	4.2	31	14.2	28	11
9..	24	19	4.8	25	3.8	20	6
10..	29	19	1.2	29	0.2	24	3
11..	29	10	—	29	10	22	16
Totals..	298	11	25.55	299	16.55	254	14.25

Gross yield = 84.96 per cent.

NOTE.—* Charge L.O. 5 foamed heavily with loss of metal by ejections.

Gross yield (excluding L.O. 5) = 87.38 per cent.

TABLE 5.

Trial.	Iron.		Lime.
	Si	P	Cwt./ton gross yield.
	Per cent.	Per cent.	
Kaldo 1 ..	0.74	0.67	1.56 for 28 per cent. scrap.
Kaldo 2 ..	0.79	0.67	2.09 for 8 per cent sinter.
LD	0.81	0.65	2.20 for 7 per cent scrap.
Present LD ..	0.93	0.43	2.12 for nil scrap.

which oxygen is injected and as the temperature increases over this period, the earlier colour changes to a distinctive brown and is accompanied by an increase in flame. The end of this period coincides wth a maximum flame size and corresponds very approximately to 1 per cent. carbon in the metal. Following this, the fume becomes progressively lighter in colour and, together with the flame, lessens in extent until about 0.15 per cent. carbon is reached. Below this level further shortening of the flame is very rapid and it may be accompanied at very low carbon levels by a suggestion of greyish fume. During this short interval before turning down for tapping, some slight degree of control was attempted by blowing oxygen at lower rates for intervals of ¼, ½, and 1 min.

Appearance of the Slags

Inspection in the early stages of a blow, *i.e.*, at the end of 10 to 15 min., revealed a thick slushy slag, often with some undissolved lumps of lime. Further blowing resulted in the development of a uniform slush. It was the persistence of this type of slag in the first few charges which prompted the use of fluorspar in subsequent charges. These additions decreased somewhat the duration of this slushy condition in terms of oxygen blowing time, but slags in all charges passed through this stage, which results from the early addition of nearly all the lime necessary.

At a still later stage in the blows the slags changed quite suddenly to the true liquid "boiling" slag associated with an open-hearth furnace bath in good condition. Slag "pancake" samples at this stage revealed, in most charges, the usual mat black surface which indicates a composition capable of adequate dephosphorization of the bath providing the Fe content is high enough. Any suggestion of "glossiness" in other charges constituted the reason for "trimming" with small quantities of lime. The change to a true liquid boiling slag occurred in the vicinity of A in Fig. 4, *i.e.*, after the Fe content of the earlier slag had reached a minimum and was beginning to rise again. This corresponds to 65 to 70 per cent. of the total blowing time. From this stage blowing was interrupted at intervals to determine the level of Fe in the slag, the final object being to secure 18 to 22 per cent.

Analyses of Hot Metal Used and Steel Made

These are given in Table 3. The P content of the hot metal varied between 0.3 and 0.6 per cent. With the exception of blow No. 10, all P levels in the finished steel are below the maximum specified and those for blows Nos. 1, 5, and 21-23 are very good. The tapping slag from blow No. 10 was too low in "Fe" and undoubtedly another 30 sec. blowing would have remedied this by raising the oxygen potential of the slag. Blow No. 4 was the first charge in which severe foaming occurred and the greatly prolonged time necessary to manipulate this charge, erroneously prompted tapping at too high a C level and too low a slag Fe content.

Most casts behaved well in teeming. A few necessitated the occasional use of oxygen to clear the nozzle. All ingots rimmed vigorously and developed a thick rim, ensuring deep-seated blowholes. A few ounces of Al were added to ingots from some casts for control purposes to preserve a level rim and prevent sinking. There was little difference in the behaviour of these ingots and those from open-hearth rimming steels to the same specification.

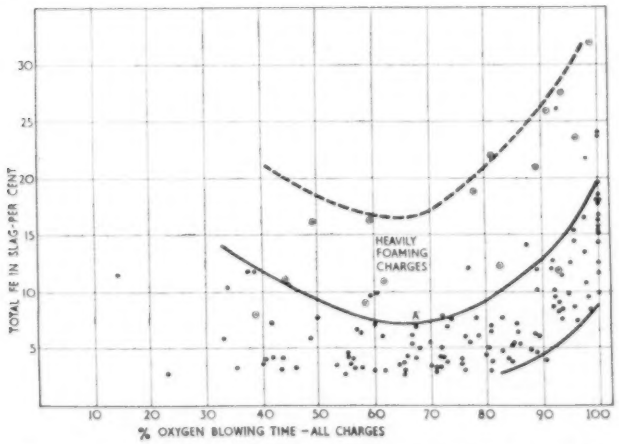


FIG. 4.—RELATIONSHIP BETWEEN TOTAL IRON IN SLAG AND THE OXYGEN BLOWING TIME IN THE EXPERIMENTAL LD BLOWS.

Slag Analyses

Table 2 lists the analyses of all tapping slags in consecutive order. The aim in a preliminary calculation for lime was to produce 46 to 48 per cent. CaO in the tapping slag. Levels achieved are lower, indicating an appreciable attack on the lining. This could perhaps have been expected because of the relatively large slag volumes necessary for the quality of hot metal used. In the first two charges blown, the tapping slag Fe content is higher than necessary, 18 to 22 per cent. being aimed at. Lack of experience caused this, since it was not appreciated in the first two blows how fast the slag Fe rose with blowing time after the C content had fallen to 0.15 per cent. approximately.

Four slags deserve specific mention—those for blows Nos. 4, 5, 22, and 23. All these charges foamed

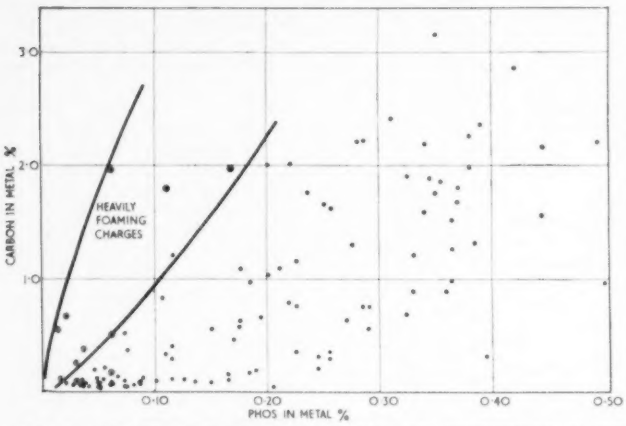


FIG. 5.—RELATIONSHIP BETWEEN CARBON AND PHOSPHORUS IN THE METAL DURING THE COURSE OF THE EXPERIMENTAL LD BLOWS.

excessively and it will be seen that the slags are among the highest in MgO contents, *viz.*, 7 to 13 per cent. The slags from blows Nos. 5, 22, and 23 are low in SiO_2 and, consequently, the Fe contents are higher than desired. With the exception of blow No. 23 the last dozen slags show a reasonable consistency in composition, particularly with respect to CaO and total Fe contents, a result of increased experience. In the two trials abroad, in which the hot metal was substantially constant with respect to Si and P, the CaO and total Fe contents of the final slags varied between 37.5 and 58.0 per cent. and 10.0 and 27.0 per cent., respectively.

Behaviour of Carbon and Phosphorus

The analytical results for the intermediate metal samples taken during each charge enabled the relative behaviour of C and P in the metal to be studied. Fig. 5 shows this relationship. All results obtained have been plotted. The resulting "band" is very broad and similar to that produced by a corresponding plot of results from the foreign trials. The main feature of interest is that all samples taken from charges which foamed heavily lie nearer to the C axis than the remainder. This difference in relative positions indicates a link between the ability or otherwise to dephosphorize at relatively high levels of C and one can conclude that in most charges in which heavy foaming did not occur P elimination to acceptable levels only takes place at low C levels. The problem of foaming is considered later.

Behaviour of Sulphur

The presence of S in the fuels used in the O-H furnace results in some absorption of this element by scrap during the melt down and subsequently presents a hindrance to its removal from the metal via the slag to the atmosphere. This condition does not exist in the LD process since the total S input to the system receives no contribution from the atmosphere. While most LD plants successfully produce low-sulphur steels for deep drawing, the above characteristic of the process is not necessarily responsible for the low S levels achieved. The present results indicate that considerable variations in the degree of desulphurization can be encountered and Fig. 6 illustrates these. Since a constant level of S in the hot metal for each blow could not be achieved, the actual levels have been plotted in descending order of magnitude, as shown in the top curve. Below this curve the corresponding "percentage drop" achieved for each blow is plotted.

In the first two blows (Nos. 1 and 2) the S content of the steel was higher than that of the hot metal. A reasonable explanation is that the slagged coke ash which had soaked into the lining during heating up the vessel was responsible for the increase.

The variations in degree of desulphurization achieved in the other blows are apparent and, while one would not expect to achieve a high percentage S drop in steel made from hot metal with a very low initial S

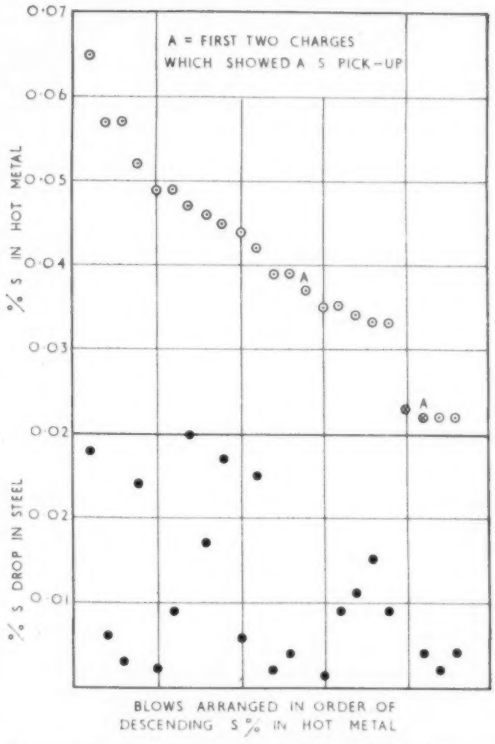


FIG. 6.—RELATIONSHIP BETWEEN PERCENTAGE SULPHUR ELIMINATED AND PERCENTAGE SULPHUR IN THE HOT METAL.

content (last three points in Fig. 6), some explanation is necessary for variations encountered in the remainder.

It is reasonable to assume that reactions between slag and metal governing S removal in the oxygen processes are identical with those in the O-H furnace. Experience of the latter shows that desulphurization, either by CaO or Mn, is favoured by a slag low in Fe and SiO_2 and high in CaO. The premature addition of oxide to the slag in an O-H furnace will slow down or even stop temporarily desulphurization of the metal, because an increase in the Fe content thereby occurs when SiO_2 is "high" and the CaO is "low."

Present results are in accord with these statements. The five charges showing the highest percentage S removal either received no oxide additions during the blow or only small quantities when the bath was relatively low in C (0.50 per cent. or less). By the time this C level has been reached the slags are lower in SiO_2 and higher in CaO contents than at higher C levels. Such slags favour desulphurization, the extent of which therefore increases. This does not imply that a low degree of desulphurization is necessarily accompanied by a high Fe content in the tapping slag, since a high Fe level is finally achieved by a high degree of basicity (low SiO_2 content).

It is suggested therefore that in the LD process the maximum possible degree of desulphurization is not likely to be achieved by "early" additions of oxide. These additions should be made in the later stages of a blow at a time which corresponds to the refining stage proper in the OH process, *i.e.*, after clear melting when the slag is uniformly liquid and of adequate basicity.

Behaviour of Temperature

When sampling during the blows, metal temperatures were taken by immersion pyrometers. Results obtained are given in Fig. 7. When plotted against blow times, temperature shows an almost linear increase between that of the hot metal and at tapping. The width of the temperature band corresponds very closely to that found in the foreign trials. More extensive experience would reduce the range of tapping temperature. A high level, about 1,650 deg. C., was necessary in these experiments to avoid excessive skulling and stopper troubles.

Foaming

Four charges already mentioned, blows Nos. 4, 5, 22, and 23, were outstanding in the degree of foaming encountered. While it cannot be said with certainty that other charges did not foam for some period, or to some degree, there was no very marked evidence at any turn down of the converter, the slags being mainly slushy (solid plus liquid phases) up to some 70 per cent. of the blowing time. Some of these, however, possessed a degree of "puffiness" which showed a variable tendency to subside with time while the converter was horizontal.

The severe foaming encountered commenced at a high level of C, 2 per cent. or over, and continued until the Fe in the slag had passed the "minimum" level (Fig. 4), after which, in all charges a true boiling liquid slag developed. First evidence of serious foaming occurred when the lance ceased to hiss. This was followed by a "fluffing" noise and it was then concluded that the tip of the lance was immersed in foam, indicating a slag depth of at least 5 ft. 6 in. When blowing was continued beyond this stage the whole vessel became filled with foam and violent ejections in the form of swirling plates took place. The first encounter was alarming in its severity and the expedient adopted was to withdraw the lance rapidly and continue to blow at a reduced rate on to the surface of the foam. This resulted in some sinking and the lance was inched down to follow the falling surface until blowing could be continued at the normal level and rate. In all cases this procedure had to be repeated several times because the foam rapidly redeveloped and, consequently, for these charges, time and oxygen consumptions were severely increased (Table 1).

In two charges, blows Nos. 22 and 23, attempts were made to pour off some of the foam, and while this was done, even the action of tilting the vessel slightly caused the foam to swell and overflow. Bleeding off slag under these conditions causes loss of yield because the foam contains appreciable iron "spray" in suspension.

The problem of foaming and its control is not solved in spite of numerous theories. Kosakevitch[1] states that a foam is stabilized by an absorption film rich in SiO_2. Also, phosphorus compounds are known to be surface active and contribute

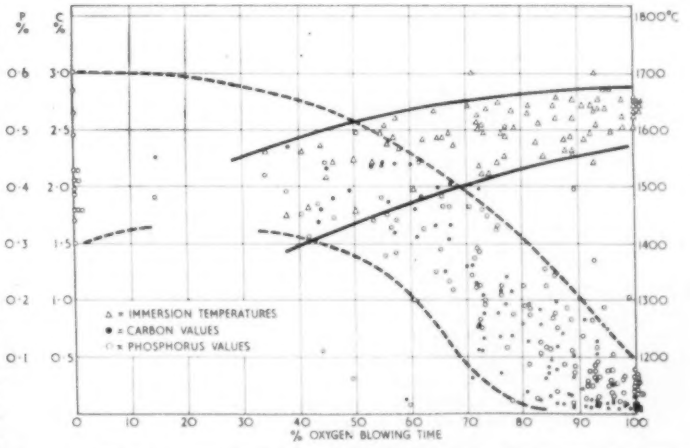


FIG. 7.—RELATIONSHIP BETWEEN OXYGEN BLOWING TIME, TEMPERATURE, AND REMOVAL OF CARBON AND PHOSPHORUS.

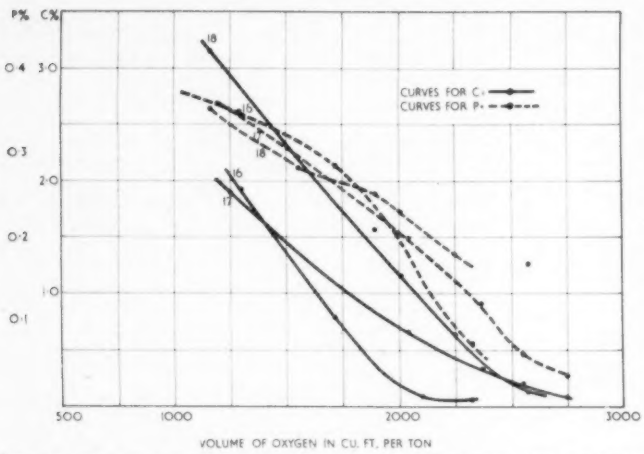


FIG. 8.—RELATIONSHIP BETWEEN OXYGEN CONSUMPTION (CU. FT./TON) AND REMOVAL OF CARBON AND PHOSPHORUS FOR BLOWS NOS. 16, 17, AND 18.

thereby to foam stabilization, particularly when dissolved in FeO or FeO-SiO_2 mixtures. According to Cooper and Kitchener[2], silica rich CaO-SiO_2 slags foam vigorously on the addition of P_2O_5.

The fact that in all the foaming charges encountered, P was removed to a greater degree at a higher level of C than occurred in the remainder (Fig. 5), indicates, on the basis of quoted statements, that the initiation of foaming coincides with a sudden increase in the rate of transfer of P from metal to slag in the early stages of a blow. This initiation "point," because it did not occur in every charge, may be a function of several factors, critical values for each of which occur at the same instant. It is likely that these factors involve temperature, "basicity," SiO_2 content, and oxygen potential of the slag. That the latter is a factor appears to be indicated in Fig. 4, in which "Fe in slag" values are plotted against blowing time for all blows. The marked difference between the Fe contents of foaming slags and those from charges which did not obviously foam is clearly seen, a much higher level of Fe existing in the former throughout. This higher level is not easily explainable (although three of the foaming charges end with the lowest SiO_2 levels favourable to the development of a high level of Fe). It is also possible that the Fe in solution is supplemented by very fine metallic spray which passes the sieve used for sample preparation, but this is not likely to be so when slags arrive at the true liquid boiling stage near the end of the blow. The causes and effects of foaming slags are not at present clearly definable.

It has been stated that in severely foaming charges the P was removed to a greater extent at higher levels of C than in other charges (Fig. 5). This is further illustrated in Figs. 8 and 9, in which C and P scales have been made to correspond so that the positions of the curves relative to each other show the differences in elimination rates when plotted against blowing time. In Fig. 9 for blows Nos. 4, 5, 22, and 23 the P curves are below the corresponding C curves.

It is of interest to consider the possible reasons for these marked differences in behaviour. One can visualize a heavy foaming charge as being similar to the state existing between a gas and its liquid under conditions of critical temperature and pressure; the interface between the two cannot be defined. During foaming an abnormal increase in surface contact area between slag and metal undoubtedly occurs accompanied also by a violent interchange in the form of metal spray—at least near the nominal interface. While in itself this state coincides with a relative speeding up of dephosphorization of the metal, it does not explain why the rate of dephosphorization overtakes the rate of C drop. The evolution of bubbles of CO from the bath, however, must be effected against two opposing pressures (*a*) that of the atmosphere and (*b*) the pressure due to the weight of slag above the "surface" from which the bubble is evolved. Since the weight of slag per unit area

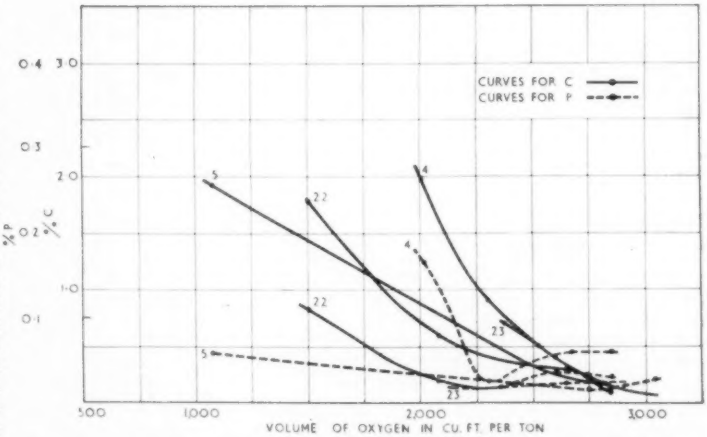


FIG. 9.—RELATIONSHIP BETWEEN OXYGEN CONSUMPTION (CU. FT./TON) AND REMOVAL OF CARBON AND PHOSPHORUS FOR BLOWS NOS. 4, 5, 22, AND 23.

of the bath is the same whether a true liquid or a foam (although it is possible that the latter may exert a somewhat greater pressure if higher in Fe content), then the foaming slag, because it is of greater depth, must act as a porous membrane. Consequently, the evolution of CO becomes akin to a diffusion process, *i.e.*, much slower and the partial pressure of CO within the bath is appreciably raised. Such an explanation is tentative, but the experiments have shown that the rate of dephosphorization of the metal does, under conditions of severe foaming, overtake the rate of decarburization.

It appears, therefore, that if high C levels with low P levels are to be achieved in the LD process when using medium or high P metal, then the initiation and adequate control of foaming will be a necessary working requirement. Without this, the process is best suited to the production of very soft steels only. Under non-foaming conditions a maximum production rate is ensured, since extra time involved in controlling the slag and the bath composition for higher C levels is not necessary. From Table 2 three of the four foaming charges produced slags which were among the highest in MgO content. It seems possible, therefore, that production of higher C steels might result in a heavier lining attack, a state of affairs opposite to that of the O-H process.

General Comments

These experiments, while equal in scale and extent to those conducted on the process abroad, had the disadvantage of being made intermittently. It was not possible, therefore, to determine the maximum amount of scrap or ore which could be absorbed by any charge. In addition the hot-metal analysis was not sufficiently constant for such a purpose. Blow No. 20 did, however, receive 12 cwt. of ore and 16 cwt. of scrap and, since the heat requirement for ore is greater than that for an equal weight of scrap, this charge indicated an ability to absorb scrap only, at least to the same extent (7 per cent.) as in the Austrian trials with Consett iron. Continuous practice would establish maximum quantities possible in a short time.

While scrap can be substituted by oxides for cooling purposes, it is apparent that these should be as high as possible in Fe content. The use of low-grade ores, high in "acid" slag forming constituents is obviously disadvantageous.

The extent of the experiments was limited by the time available before it became necessary to resume duplexing for increased production. After blow No. 23 it was found that the lining was thin in the vicinity of one trunnion and time did not permit a renewal and a further series of blows.

Material Consumptions and Yield

Metallic Yield

Table 4 lists the relevant quantities. The ingoing materials for all charges were weighed, but the outgoing materials, that is, ingots, skulls, and scrap were weighed for the first 11 blows only, using the mixer weighbridge. Ingots from blow No. 12 onwards were directed to the stripping bay on their cars and weights were estimated. These figures have not been included therefore. Also, from the first 11 blows it was convenient to weigh scrap and skulls collectively. Consequently, the overall average yield for these blows is given. If blow No. 5 (from which metal was lost by ejection during foaming and which was characterized by an excessive Fe level in the slags) is included, the overall yield is 85 per cent. Omitting this charge as being not strictly comparable, then the average yield for 10 blows is 87.4 per cent.

This value is disappointing, but some improvement would be expected in continuous practice. Also some benefit might accrue from a larger charge and vessel. Better control of the slag Fe level to within narrower limits would also improve the yield.

Oxygen Consumption

The high consumption of oxygen per ton of metallic yield is attributed to the limited approach of the lance to the metal, coupled with the low oxygen pressures available. Appreciable quantities of oxygen were lost when raising and lowering the lance frequently. Some form of quick "on-off" oxygen valve is necessary.

Lime and Spar Consumptions

It was not found possible to weigh the slags produced, but approximate calculations were made for the first 11 blows as follows:—

(1) *By Lime Balance.*—The total lime added (excluding that for dams) was 541 cwt. for 254.7 tons gross metallic yield. This is equivalent to 2.12 cwt. of lime per ton. Since the average CaO content of the slags was 43 per cent. approximately and since the lime used contained 88 per cent. CaO, then the average slag bulk was 4.05 cwt./ton of gross yield.

(2) *By P Balance.*—By neglecting, for these approximate calculations, the P remaining in the steel we have:—

Average phosphorus in the metal blown	= 0.43 per cent.
Average gross metallic yield per charge	= 23.15 tons
Average weight of P per charge	= 0.116 tons
Average P_2O_5 in slags ..	= 5.66 per cent.
∴ Average weight of slag per charge	= 4.69 tons
∴ Weight of slag per ton gross yield	= 4.06 cwt.

These values, while in good agreement, do not take into account absorption of dolomite from the vessel lining. It is estimated therefore that slag production amounted to 4.25 cwt./ton of gross yield. This value is greater than would be expected from a "high" hot-metal O-H charge (*e.g.*, 70 to 80 per per cent. hot metal containing 1 per cent. P). From such a charge the removal of a primary slag would be essential and this suggests that some economy in lime consumption might have been achieved in the present experiments by some slag removal when the Fe content was lowest. This remains to be investi-

gated, but it is interesting to note that the average lime consumption of 2.1 cwt./ton of gross yield is very close to the values encountered in the foreign trials, as shown in Table 5.

It will be noted from Table 1 that the tendency to use spar increased as the blows proceeded, particularly where lime additions were heavier to compensate for higher P levels in the hot metal. From its less frequent use in the first 11 blows, it is obviously not an absolute necessity, neither (as in blows Nos. 4 and 23) is it necessarily a cause of foaming.

General Conclusions

The experiments have served a useful purpose in introducing the process to a number of personnel who will be concerned with it in the future. A modest experience has been gained in actual manipulation and ideas for developing controls to suit local conditions have been prompted.

The most prominent feature encountered has been the haphazard occurrence of excessive foaming in certain charges. These charges showed a distinctive characteristic in that, for a given level of C in the metal, the P content was lower than in charges which did not obviously foam. It appears essential, therefore, that to produce steels other than low C foaming must be purposely initiated and also controlled in its severity. Foaming was encountered in the foreign trials and its complete control has not yet been evolved in any steelmaking process.

The experimental blows have confirmed that it is possible to produce low C rimming steels from hot metal containing up to 0.6 per cent. P with a single slag practice, although probably at the expense of increased refractory consumption.

It is possible to produce ordinary quality rimming steels without metal analysis provided stoichiometric quantities of lime are added "early," the tapping point being determined by the level of Fe in the slag.

It is concluded, from indications given, that additions of oxide made too early in the blow will prevent a maximum degree of desulphurization being achieved. With early "complete" lime charging the use of oxide as a coolant is preferably confined to the refining period (*i.e.*, the last 30 per cent. approximately of the blowing time).

The production rate was highest in charges of very soft steels (below 0.10 per cent. C) which did not obviously foam. From this it is concluded that the production of higher C steels involving controlled foaming and intermediate sampling will not be so rapid.

Acknowledgments

The experiments were the results of combined efforts between personnel from the research department and the O-H plant. The author is indebted to Mr. Amos, steel superintendent, his own research staff, and to the operators who were at all times willing and keen.

Thanks are also due to the Consett Iron Company, Limited, and to Mr. F. B. George, managing director, for permission to publish.

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[1] P. Kosakevitch, Rev. Mét., 46 (1949), 505 and 572.
[2] Cooper and Kitchener, J.I.S.I., Vol. 193, Pt. 1, p. 48.

GEC EQUIPMENT FOR SELF-UNLOADING VESSEL

ORDER worth approximately £125,000 for a materials handling plant with a maximum unloading capacity of 2,000 ton/hr., to be installed in a self-unloading ship, has been placed by William Hamilton & Company, Limited, Glasgow, with the General Electric Company, Limited. The vessel is being built by William Hamilton & Company for North American owners; when the ship is commissioned it will operate in Canadian waters.

Coal, limestone, and other bulk cargoes will be carried in four holds which are to be fitted with a number of pneumatically operated gates through which the material will be discharged onto two 48-in. wide belt conveyors. These conveyors, disposed one on each side of the vessel, will take the material to the fore part of the ship where it will be collected by a 96-in. bucket elevator. The bucket elevator will lift the material through approximately 60 ft. to deck level, where it will be discharged through a chute, onto a 200-ft. long, 60-in. wide boom conveyor. This boom conveyor is to be mounted on a turntable which will allow it to slew through 120 deg. from either side of the centre line of the vessel. Slewing will be carried out by two of the ship's winches.

GEC is to supply, from its Erith Engineering Works, 82 unloading gates, together with all the associated pneumatic operating system, the two 48-in. wide belt conveyors, the 96-in. wide bucket elevator, and the 60-in. wide boom conveyor. In addition, all the associated electrical equipment, excluding cabling, will be supplied by the company's Witton Works.

"Taxation in Western Europe"

This book was originally published in 1957 under the title "Taxation in the Proposed European Free Trade Area." A second (revised) edition was published to meet the demand for it. Political and economic events dictated the change to the present title on the publication of the third edition, and this fifth edition of the book is the third revision under the present title of "Taxation in Western Europe." In future, in order to meet the continuing demand for the information it contains, the book will be published regularly in June each year. Copies are obtainable from FBI Print & Publications, 21, Tothill Street, London, S.W.1, price 20s., post free.

Coal Ploughing

IN THE BEESTON SEAM

at St. John's Colliery

by B. HATHERTON*, C. MEYRETT†, and A. S. HARRIS‡

In this paper, presented to the Yorkshire Branch of the National Association of Colliery Managers on December 14, 1960, the authors summarize their experience of coal ploughing in the Beeston Seam at St. John's Colliery, No. 7 (Wakefield) Area, North-Eastern Divisional Coal Board. The Lobbe Hobel rapid plough was first installed, the face being pre-cut. Initially a 6-ft. cut was applied and roof conditions were found to deteriorate; they were restored by reducing the depth of cut. An Anbauhobel was installed at the next face and it was found to plough without pre-cutting, a face o.m.s. (saleable) of 11.2 tons being obtained.

ST. JOHN'S COLLIERY is situated in the west Yorkshire Coalfield at Normanton, about nine miles south-east of Leeds. The Sharlston Coals outcrop in the near vicinity, and between about 1878 when the first shafts were sunk up to the present time, workings have been contained in the Middle Coal Measures.

The principal coals worked were the Stanley Main, Haigh Moor, and Silkstone seams. Faulting is extensive, the main ones lying generally in an east to south-easterly direction. The North Newland fault lies just south of the original shafts and initially workings were restricted to the north, *i.e.*, between the North Newland (which throws 190 yd. down to the south) and Normanton Station fault about 1,000 yd. to the north.

In order to facilitate the working of the major southern area of the take, the sinking of No. 2 shaft was commenced in 1924 and this went down 592 yd. to just below Silkstone Seam, the present winding level. The old No. 1 shaft has been subsequently extended through both Top and Bottom Beeston seams to the South Silkstone horizon and a level drift connection made between the two shafts. A locomotive road, driven through the measures at 1 in 300 to the No. 2 winding level, affords access to the Lower Middle and Upper Lower Coal Measures (Fig. 1).

As a preliminary to the extensive working of the Top Beeston it was decided to work the restricted area in the vicinity of the old No. 1 shaft and No. 2 face is the first face formed from the original opening out panel. A coal plough was installed and the face was set off to strip along a 180-yd. downthrow fault at its right corner, and at about 300 yd. was expected to turn at 30 deg. to follow the fault (Fig. 2). The area of coal bounded by the faults is not a large area and opportunity had to be taken in working the panels to ensure total extraction without undue drivages of subsequent panels. The working of this section of the seam was complicated by support pillars for the shaft and surface buildings.

The face was about 142 yd. long, advancing end on, with a main gate stable of 11 yd. and a tail gate stable of 9 yd., leaving a plough run of 122 yd. The face advanced to the rise of 1 in 38 and was on level line across the face. The seam thickness was 42 in., overlain with black shale and clod 9 in. thick which parted freely from the grey bind above. The main and tail (supplies) gates were ripped to a parting which allowed 12-ft. by 8-ft. arches to be set with 8 in. of stilt. Packs 12 to 13 ft. wide were put on each side of the gates.

Face Equipment

Supports used were as follow:—The gate end and pack holes were supported by Hanman 6-ft. bars and Dobson props, and the plough section of the face by Schloms link bars and Dobson props. The Schloms bars had an effective length of approximately 2 ft. 8 in. and the Dobson props were fitted with extension tops and caps. After some weeks the props were fitted with crown tops and wooden lids in preference to the pads, due to side slip of the bars to the extent that occasionally the bars slipped completely off the prop, causing concern to the men working at the face.

The goaf was supported by strip packs 9 ft. wide, spaced at intervals of 30 ft., with three chocks in each waste incorporated in the supports

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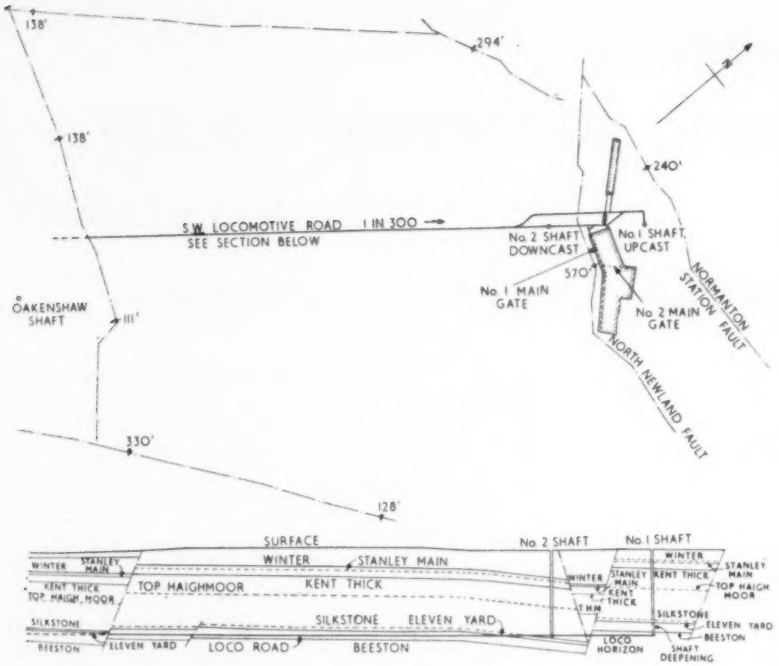


FIG. 1.—PLAN AND SECTION SHOWING THE WORKINGS IN THE TOP BEESTON SEAM IN RELATION TO THE COLLIERY TAKE. THE SECTION IS ON THE LINE OF THE SOUTH-WEST LOCOMOTIVE ROADWAY, AND THE SEAMS WHICH HAVE BEEN WORKED ARE INDICATED BY BROKEN LINES.

system. An advance of 6 ft./day was expected, the coal being pre-cut.

The following machinery and equipment was installed for the working of the district:—Loebbe Hobel rapid plough and Panzer conveyor; one coal cutter in each stable; one pre-cutter on the plough face; one C.P. compressed-air borer; a 2-in. compressed-air hose through the face with a ¾-in. air hose and a compressed-air pick for each man on the plough face; 30 compressed-air rams working at a pressure of 70 lb./sq. in.; two compressed-air picks in each stable; a Meco stage loader was installed to deliver on a 30-in. Sutcliffe gate conveyor, but this was discarded after the turning of the face.

Power was supplied into the tail and main gates at 550 V, through 0.075-in. double-wire armoured cables from a 250-kVA transformer, as shown in Fig. 3. A bank of five switches was situated in the main gate for the control of the Panzer and plough, both face and main-gate stable coal cutters, and the Gullick pump. One spare switch was also installed. All switches were Semlo 1 by Baldwin & Francis, Limited. A bank of four switches, two for Panzer and plough, and two for face and stable cutter, was also situated in the tail gate.

It must be noted that only one 45-h.p. motor was fitted at the main-gate gearhead as against two similar motors at the left gearhead.

The plough chain was driven through reduction gears from the Panzer drive shaft. The switch in the main gate which controlled the Panzer and plough was fitted with a master unit, controlling the three motors. A sequence cable connected this main switch to the two switches in the tail gate, these being fitted with slave control units. Davis push-button signals were fixed on the Panzer.

The sequence and signal cables were secured to

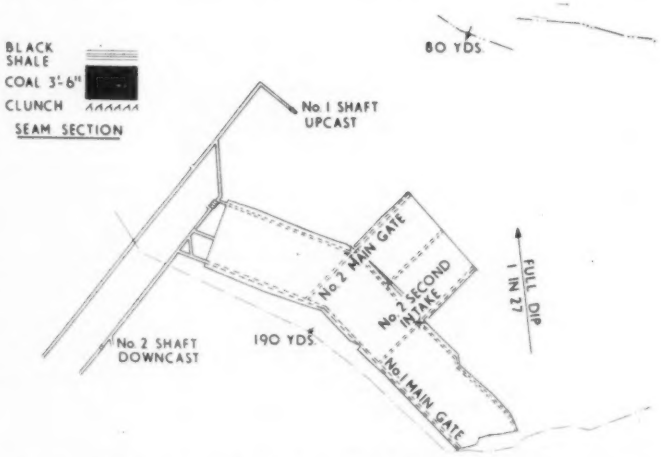


FIG. 2.—THE POSITION OF NO. 1 AND NO. 2 DISTRICTS IN THE TOP BEESTON SEAM AT ST. JOHN'S COLLIERY.

the goaf side of the Panzer, with covered protection for the signal-push button switches, each man having two signal push buttons.

The following faceworkers were employed:—Main-gate stablemen, 4; tail-gate stablemen, 3; plough men, 10; main and tail gate stable-cutter men, 2; plough face cutters, 2; rippers (four in each gate), 8; borer, 1; and main gate dint, 1, making a total of 31. In addition, there were two plough operators, one electrician, one fitter, one shotfirer, and three deputies.

Difficult Roof Conditions

The sequence of operations was that during the dayshift the face was ploughed, both gates ripped during the afternoon shift, and the stables and plough face section cut during the night shift.

The face commenced operations in October, 1957, with a 6-ft. pre-cut. After several cuts had been taken weighting occurred. This was not unexpected in the circumstances, but occurred to a degree more severe than was expected, and although precautions had been taken by setting extra supports, such as packing, chocks, Dobson props, and link bars, conditions deteriorated very rapidly and long stretches of the roof clod broke down. Even where this was held, the roof lowering at the face edge created great difficulty in the operation of the prop-free-front system of support.

For several weeks, operations continued under great difficulty and a daily move over became impossible. Although the men were of excellent quality, morale naturally deteriorated as conditions worsened. It was then decided to reduce the depth of cut by 50 per cent. The effect on face conditions was immediate after commencing the 3-ft. strip. Convergence was negligible, no face edge break developed, the clod was held throughout the face and gate end conditions improved, enabling better packs to be put on to reduce subsequent gate convergence.

It was also decided to rip each gate forward to within 4 ft. of the stable so that each gearhead operated in the gate. This further improved conditions, especially at the main gate end, and also resulted in less alteration of supports at the gate end to enable the gearhead to be moved over.

After advancing several yards under these conditions, an attempt was made to strip two cuts per shift, but this was not altogether successful, and the jib was extended to take a 3-ft. 6-in. cut, without affecting the good conditions. The introduction of the shorter cut reduced output per strip, but this was more than balanced by the improvement in conditions, which enabled a daily move over and an o.m.s. higher than that obtained in the initial difficult conditions.

After two weeks on the 3-ft. 6-in. cut, a further extension was made to a 4-ft. cut, conditions again remaining very good and a regular move over was maintained with a further improvement in output per strip and higher o.m.s.

The jib was again extended to make a 4-ft. 6-in. advance and, after several strips, there were indications that a limit had been reached in the depth of the cut. A face edge break began to develop, slight weighting occurred each move over, and the clod became broken, but was successfully held. It was deemed prudent at this stage to consolidate the system on the 4-ft. 6-in. advance.

The face moved forward regularly to the position where the face and gate lines were turned to follow the fault line. At this point, hydraulic rams were introduced on the face in place of the compressed-air equipment and an attempt was made to plough the solid coal on the new line. This did not altogether fail completely, but progress was not so good as with the pre-cutting. The plough clutch, which was compressed-air operated, was not of sufficient capacity to operate the plough in solid coal, and even though the comparatively low pressure of 150 lb./sq. in. was used, the plough motor was constantly stalling; at lower pressures it passed along the face without biting the coal. Useful experience and knowledge were gained during this short period of attempted solid ploughing, giving confidence that, under certain conditions in the Beeston Seam, ploughing could be accomplished without precutting.

From the turning point, the face moved forward regularly until it met a known fault of 5 ft. throw. Conditions proved much too difficult and the plough was withdrawn, leaving the face to continue as an orthodox conveyor unit.

The o.m.s. on this unit when moving over on the 4-ft. 6-in. cut was 5.8 tons per faceworker. Product sizes and percentages were as follow:—Over 6-in., 17.8; 6-in. to 4-in., 4.5; 4-in. to 2-in., 16.4; 2-in. to

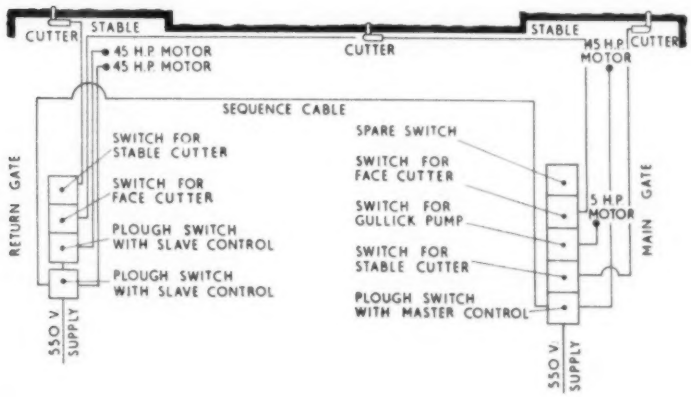


FIG. 3.—ARRANGEMENT OF ELECTRICAL EQUIPMENT FOR THE BEESTON NO. 1 (PLOUGH) FACE AT ST. JOHN'S COLLIERY.

1-in., 8.6; 1-in. to ½-in., 15.4; ½-in. to ¼-in., 19.7; ¼-in. to 30 BSS, 10.9; and below 30 BSS, 6.7 per cent. As the Beeston Seam had not been worked previously by orthodox methods or other methods of work, no comparison of sizing is possible.

Conclusions from Initial Results

The following conclusions were reached from the results of No. 1 unit:—(1) Much better conditions could be obtained by ploughing from the solid thus eliminating pre-cutting, but a different plough and drive would be needed. (2) Better roof control would be obtained if pre-cutting was eliminated and from this a lower and constant methane content would result. (3) The plough team and stablemen were out of economic balance and a longer face was needed. Cuttermen would be redundant and less capital expenditure would be necessary. (4) Better conditions would reduce the number of men required to rip the gates. (5) Stablemen and plough men could considerably improve their output in improved conditions. (6) The amount of machinery and apparatus would be in better proportion to the output of the face. (7) Loss of material would be reduced. (8) Overloading of the trunk belt could be avoided (this had been rather severe on No. 1 unit during the first part of the shift).

Also, the morale of the men would be held, if not improved, when working in consistently good conditions, and the district officials, who had worked hard during the initial difficult period when conditions were not good, also appreciated the improvements made and looked forward to taking charge of a plough face again.

Equipping No. 2 Unit

The benefit of these conclusions was obtained in laying out and equipping No. 2 unit which was developed by men from No. 1 unit and, during the course of development, they were informed of the changes to be made. They often demurred at the proposed changes in disposition of labour, but they all remained very eager to work on No. 2 unit.

As shown in Fig. 2, No. 2 unit was opened out from the ribside of the return gate of No. 1 face, the face being opened out about 15 deg. from bord. Sufficient coal was extracted between the old ribside line to the proposed initial starting line of the new unit to provide between 15 and 17 yd. of solid stowing in order to protect the return gate and prevent excessive convergence. The dirt for stowage was obtained from the overcasts and scourings connected with the unit.

The total length of face is 217 yd., the plough section 200 yd., the main-gate stable being 9 yd. and the right-hand gate stable 8 yd. The main gate and the right-hand gate form the intake airways and the centre gate is the return. All gates are ripped to set 13-ft. to 12-ft. by 8-ft. arches with 6 to 8-in. stilts. The face is supported by Dobson props and Schloms bars. Initially, wooden chocks were set in the wastes, but they have been replaced with Muschamp chocks.

The following machinery and apparatus was installed:—Anbauhobel plough and Panzer conveyor 40 Gullick hydraulic rams; one Gullick hydraulic pump of 5 gal./min. capacity; switch and control gear; reinforced 2-in. compressed-air hose throughout the face and to each stable from 4-in. pipes in the centre gate; hose fitted with auto valves every 20 yd.; 20 yd. of ¾-in. compressed-air hose and a pneumatic pick for each man on the face and also for one compressed-air pick in each gate; one C.P. compressed-air borer, and one 30-in. Sutcliffe gate conveyor. No stage loader was installed in this unit, as a more constant feed of coal was expected than that from No. 1 unit.

Power to No. 2 district is again supplied from a 250-kVA. transformer at 550 V., 3-phase, 50 cycles, through 0.1 sq.-in. double-wire armoured cables, but only to the main gate where all electrical apparatus is installed. Because of the extra face length, there are four motors of 45-h.p., two for the Panzer drive and two for the plough drive; control is by Baldwin & Francis switchgear.

As shown in Fig. 4, two gate-end switches fitted with master and slave control units, control the plough and Panzer motors, respectively. All switches are connected in sequence from one control push-button start with forward/reverse switch mechanical interlock. Limit switches are fitted at each end of the conveyor. The trailing cable to each motor is type 22.5 core F.S.A.

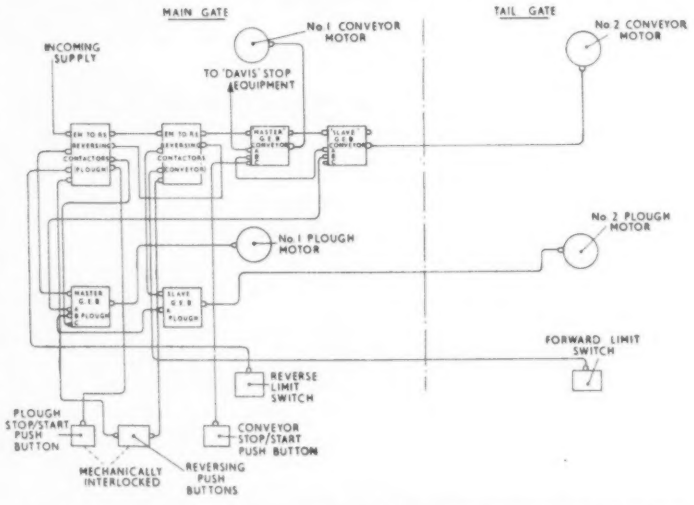


FIG. 4.—INTER-UNIT CONNECTIONS FOR MANUAL REVERSING OF GATE-END BOXES WITH LIMIT SWITCH PROTECTION AT THE BEESTON No. 2 (PLOUGH) FACE.

The manpower at the face consisted of two men in the main-gate stable, two in the right-hand gate stable, 10 in the plough team, three main-gate rippers, two centre-gate rippers, two right-hand gate rippers, and one borer, making a total of 22 men. In addition, there were two plough operators, one electrician, one fitter, two shotfirers, and three deputies.

It will be noted that an increased task had been allotted to each man on the face over that which had been done on No. 1 unit, on the confident assumption that good conditions could be maintained on this district. After installation, no immediate attempt was made to press the full advance unduly and only five men were put on the plough face, with stablemen as required.

It was hoped to slowly consolidate the stowing behind the ribside pack to prevent or minimize the damage to the return gate. In addition, experience would be gained in deciding the working pressure of the rams, and the five operators, as the nucleus of a team, would gain the knowledge of operating the controls to prevent the plough stalling and excessive shearing of pins, bearing in mind that they had previously been ploughing cut coal. During this period, the full method of support was installed.

Initially, a pressure of 850 lb./sq. in. was applied to the rams, but stalling of the plough was excessive, which was also accompanied by excessive shearing of the pins. The pressure was reduced by stages to an optimum working pressure of 450 lb./sq. in. Shearing of the pins took place at this pressure and it was thought that the shearing occurred far too easily without any undue load on the plough.

The driving couplings were drilled to take another shearing pin which greatly reduced the shearing occasions while appearing to give a safety margin for shearing under undue load. During this short session of partial working the men gained valuable experience. It should be noted that the hard coal plough which had been installed consisted of a small or squat body fitted with three cutters and a small top cutter, with three precutters or kerf cutters at each side of the body to ease the coal in front of the plough.

The height of cut taken is approximately 12 in. It was thought that a higher kerf would need excessive power to drag the plough through the face as the seam is uniformly fairly hard throughout its thickness. Also, it was expected that the tops would come without excessive use of airpicks and shots and this expectation has, on the whole, been fulfilled.

It should be noted that only one hydraulic pump is installed, this being in the main gate. Equal pressure on all rams is maintained by an enlargement of the pressure hose from the centre gate to the right gate.

The main gate stable is, at the end of each dayshift, sufficiently in advance of the plough face to enable the advance of the return end of the gate conveyor to take place during the previous nightshift. Also, the derrick can be set in preparation for the immediate pulling over of the gearhead when ploughing commences. The right tail gate stable is not so far advanced as the main gate stable, as no accommodation for the loader return end box has to be provided, as in the case of the main gate stable.

At the commencement of the ploughing shift, no time is lost in taking the plough through the face three to four times with an average "bite" of 3 in. each way. During this period all rams are put on to pressure and the gearhead is drawn over at each end. The stablemen are responsible for the setting of the derricks and the resetting of supports during the move over.

During the initial ploughing of the face, the Panzer is pushed under the top coal, of which 25 to 30 per cent. falls on the Panzer, enabling the men to start and move forward their first line of bars and props. Where tops fail to come down, they are taken down by air pick to facilitate the setting and moving forward of supports. After this initial period, alternate rams are taken off pressure, and ploughing goes on at a rather slower rate of advance. During this time the men are moving the first row of supports and also withdrawing the last line of supports. The reduction in ploughing speed, enables the men to devote almost the whole of their time to the withdrawal and the resetting of the supports.

Final Phase of Stripping

After the first line of supports has been moved forward to keep the distance of the face to within 5 ft., the men again devote most of their time to the final phase of the stripping. By this time, the plough has undercut the coal to 4 ft. and where coal has not come down or there is difficulty in getting it down with the airpicks, shots are fired, the holes having been bored during the previous afternoon shift. It must be emphasized that at no time after the first four runs of the plough are all the rams put on pressure again, alternate ones being sufficient to keep the ploughing up to the rate at which the men can withdraw and reset the supports.

The final dressing of the face is completed with the air picks and any small local deviation of the face is dealt with at or near the end of the shift by taking the plough to these points and manipulating the rams to deal with them. During the early part of the working of the face, the men were inclined to hold the plough at any deviation on their stint and do short run ploughing to deal with it and straighten off the face, this retarded progress on other stints and the Panzer was running almost without coal while this short run ploughing was in operation. They soon realized the advantage of leaving such points until later.

For some distance after commencing ploughing operations, the goaf "hung" in rather an alarming manner, but collapsed rather massively after 20 to 25 yd. advance. No excessive loading appeared to be exerted on the supports, but extra chocks and other supports had been set previously to prevent undue loading when the goaf did eventually

break down. Hardwood pads were also put under each prop to prevent floor penetration and no doubt these did useful work in the initial stages of operation. They are not now used.

There was a repetition of the weighting a little later, but it was again contained behind the supports system without undue loading of the supports. Since that time, the goaf has caved regularly as support withdrawal proceeds and no weighting or undue loading of the props has occurred. No excessive roof lowering, face edge breakage of the roof, floor lift, or prop penetration has taken place, and gate-end conditions are better than in No. 1 district.

Good, well-filled packs are being put on, and there can be no doubt that these are playing their part in preventing excessive squeezing of the packs and convergence in the gates as the face advances. The ripping in each gate is taken to a natural parting about 5 ft. 6 in. above the seam, which entails the two men in the right and centre gates removing and packing approximately 230 cu. ft. of ripping per shift and setting arches 3 ft. apart. The packholes of the right and centre gates are clean and there is not the difficulty of withdrawal of supports which was present in No. 1 unit. Thus, after the shots have been fired, the rippers are free to give almost the whole of their time to the removal and packing of the ripping dirt and setting arches to 3-ft. centres.

These two gates are ripped on a split shift (11 a.m. to 6.30 p.m.) which allows the day shotfirer to fire necessary shots in the two gates before leaving the district. The main gate, which is rather more difficult than the centre and right gates (due to floor water and damp roof conditions), is ripped on the nightshift. These men also advance the return end of the gate conveyor and put additional belt in when necessary.

All workmen on the district are very enthusiastic and co-operative and have worked with a will to ensure success. The same must be said of the district officials who have shown thought and patience in ironing out the many snags that have occurred. Some of which happen to merit description.

Overcoming Minor Difficulties

At the commencement of operations, the 9-in. clod was ripped forward at the main gate to the stable face, to provide more headroom for large coal coming over the gearhead. With the loose end provided, the falling of the clod quickly "crept" up the face and a quick and determined effort had to be made to catch and support it again. A dint was then made across the main gate and a 4-ft. channel, 1 ft. deep, made to accommodate the gate conveyor to give further headroom over the gearhead, but floor water gathered in it, making conditions very uncomfortable for the stablemen which had a very visible effect on their work. The presence of water also resulted in belt slip on the gate conveyor and floor penetration of the props which, of course, worsened conditions at the gate end.

This method quickly had to be modified to take up 6 in. of floor across the gate where the gearhead and loader return operates. A slightly thicker lift of floor is taken in the left corner to provide a small standage for the water. This 6 in. of floor is rather soft and takes little getting up, while water appears to be made there when the underlying harder floor is broken.

Stalling of the plough was frequent until the men realized the necessity of quickly releasing the nearest ram. Stalling is very quickly dealt with now. Some trouble in the initial stages of operation was caused by the men advancing their props too near the Panzer with the risk of trapping cables and air hose when the plough passed that point.

At times during the early operation, the fusible plugs of the fluid coupling at the main gate end were blown far too frequently and loss of time was often suffered. This occurrence has almost been eliminated by experience. Slight overloading of the Panzer does occur when the plough is travelling from right to left due to the rather small excess of travel of the Panzer over the plough and there can be no doubt that the plough pulls a greater amount of coal off the face in this direction, but the men have learned to halt the plough momentarily, thus making an evenly distributed load on the Panzer without overspill on the goaf side.

Summary of Results

There is no doubt that all the men on the face quickly realized that team work would cut out unnecessary stops and loss of time, and every effort is made to keep operations going throughout the shift. The spare men who are sent on this face in the event of absenteeism usually show interest in new ideas and very quickly adapt themselves to this system of mining with the help of the regular men, realizing that the shovel is, after all, not their best friend, but a tool of monotony.

At 140 yd. advance, the return airway from which pack the face started has not suffered excessive damage and remains a very good road. There is no doubt that the solid packing that was put on during the slow initial advance of the face has done good work and it is expected that no back ripping or enlargement will have to be done on this section of the road. The air crossing over the right intake suffered some damage to the brickwork, but not at any time sufficient to cause any serious leakage. It was of robust construction in expectation of crush and the damage created little difficulty. The air crossing over the loader or main gate remains virtually undamaged and has had no repair work done to it.

The right gate shows very little settling down of the arches on the stilts and convergence is very small indeed. A 4-yd. pack is put on to the rib side and a 6-yd. pack put on the left or goaf side. In the centre gate at 50 yd. from the ripping, the arch bottoms have taken up the stilt, but this was to be expected in a gate in the centre of a 200-yd. waste. There is some evidence of arch distortion at 100 yd. from the face which does not appear excessive and remains much the same without much

further settlement. The left or main gate shows rather more convergence than the right gate. Conditions for the rippers are not so good as those in the right gate due to floor water and also the presence of water in the roof and the roadhead.

There is little doubt that the main gate stablemen are the hardest worked men on the face. "Set that derrick prop," "Clean up and set a prop," "Change that prop so that we can pull over," "Break that lump" are all interruptions in their work (between extracting 380 cu. ft. of coal by airpick) of advancing the stable, which they have accepted.

The management is grateful to the local branch of the National Union of Mineworkers, which has shown the greatest interest and has given all help possible to make this effort a success, as indeed it has done on all its new coal-winning projects at the colliery.

Some experiments have been carried out in the positioning of the plough blades for "bite" and horizon. On parts of the face when ploughing commenced, the plough tended to go into the floor and lift up 4 to 6 in. of dirt, and an attempt was made to prevent this by altering the position of the kerf bits. This cured the dirt trouble too well, for the plough climbed, but further adjustments ultimately overcame the difficulty.

Very little trouble has been encountered with creep of the Panzer and, although wire-rope pulley blocks are part of the primary gear, these have never been used. It has been found sufficient to set the gearhead slide and anchor bar with slight right-hand bias, and if strict attention is paid to this, no creep takes place. The main gate slide and anchor bar is not used.

No attempt has been made to exceed the 4-ft. advance per shift, even with the addition of more men or an additional shift. The life of the face is short and the output from this face at the present time maintains a balance in output from the other three seams worked for blending purposes in the washery.

Since ploughing commenced on this face no loss of props has been reported and the only loss of link bars has been due to 25 link breakages. During the period April to October (both inclusive) 42,000 tons have been produced from this face from 137 consecutive working shifts with an o.m.s. per faceworker of 11.2 tons saleable per shift.

Five sizing tests taken from the gate belt gave the following average results:—Over 6-in., 18.9 per cent.; 6-in. to 4-in., 7.9; 4-in. to 2-in., 19.3; 2-in. to 1-in., 9.8; 1-in. to ½-in., 12.5; ½-in. to ¼-in., 16.6; ¼-in. to 30 BSS, 9.2, and below 30 BSS, 5.8 per cent.

The authors wish to express their appreciation to Mr. H. Saul, general manager, No. 7 (Wakefield) Area, North-Eastern Divisional Coal Board, for permission to publish this paper.

DISCUSSION

MR. C. APPLEBY asked if serrated bars had been considered to overcome the difficulty with the props slipping off the bars. He also asked if the electrical staff had considered the installation of a pull-wire throughout the length of the Panzer conveyor instead of push buttons and whether the rippers bored their own holes.

The AUTHORS replied that no consideration had been given to setting the serrated link bars. The Dobson props supplied had rather small concave friction pads which did not present sufficient bearing surface for the Schloms bars. After consultation with the makers, a number of crown tops were supplied which were readily accepted by the men as being more suitable. The whole installation was then changed over to crown tops. Larger friction top pads were now fitted by the makers.

On No. 1 plough unit, electric push-button signals had been used and had given efficient service with reliability. The rippers in the gates bored their own holes, although very often the rippers in the main gate got their ripping down with pneumatic picks due to the damp or wet conditions of the ripping in this gate which demanded more care than that in the other gates.

In reply to MR. W. H. DIXON the AUTHORS said they did not anticipate working a face of 200 yd. or more in a 3-ft. 6-in. seam with only two gates. There was approximately 16,000 cu. ft. or air/min. flowing through No. 2 face, with almost equal quantities from each intake to the centre return gate. If the total amount was passed through the whole length of the face, the velocity would be far too high for comfortable working conditions. To this was added the safety factor that all motors and switchgear were operating in intake airways.

MR. E. BRAMMER asked which machine the authors considered was the best for their conditions—the multi-jib machine or the plough. He also asked what were the limits in height and seam thickness to each of the machines that they were using and if difficulty was experienced with sticky tops and the coal not parting from the roof on the Anbauhobel face.

Without doubt, replied the AUTHORS, in a 3-ft. 6-in. seam of which the coal was a fairly high quality and in demand for household fuel, consideration must be given to the size of coal that could be extracted and ploughing from solid coal offered greater opportunity in achieving this object than any other machine.

The multi-jib machine had in common with other machines of the multi-cutter type, the degradation of its product, which could not be tolerated in a seam which was suitable for a household product and their use should be confined to seams where the degradation of the product was of less consequence.

At St. John's Colliery a successful multi-jib unit was working which was giving a face o.m.s. of 7.5 tons in the 2-ft. 6-in. thick Eleven Yards Seam. The seam, on the whole, was not a high quality one suitable for household coal, and the question of degradation was not so serious as in the better quality seams. The multi-jib machine was most efficient at about the face length worked at St. John's. The machine was fitted with four jibs and extracted the whole of the seam.

The multi-jib machine was the most efficient machine for the working of seams around 24 in. thick where degradation was not of serious importance.

Sticky tops and coal not parting from the roof was not a serious problem on the No. 2 plough face. Often, stretches of coal parted from the roof and fell as the plough passed through the face, and where they failed to come down, they present little difficulty with the pneumatic picks. Although the face was bored, a low percentage of the shots required to be fired.

MR. J. AIRD asked what thickness of tops was it

advisable not to fire and what protection was given to the cables through the faces. If the distance was 5 ft. maximum from the face to the front row of props, he asked for the distance from the face of the front row of props prior to ploughing. Mr. Aird asked how this distance was made up, *i.e.*, distance from face to Panzer, width of Panzer, cable carriers, between Panzer and front row of props.

Preventing Damage to the Roof

The AUTHORS replied that shots were fired only at places where 1 ft. 9 in. to 24 in. of tops were holding up. Shots were certainly not fired in tops of a few inches thick. Indeed the men preferred to get these down with their pneumatic picks to prevent damage to the roof.

In common with the compressed-air and hydraulic hose, the cables were secured to the goaf side of the panzer and were protected by the spill plates fixed on this side of the panzer. Otherwise, no protection was given or needed for the cables. The distance of the front row of props from the face prior to the plough operating was 41 in. The distance from the face to the face side of the panzer was 9 in. The width of the panzer was 28 in. which included the cables and air hose brackets, and the distance between the goaf side of the panzer and the front row of props was 4 in. The distance between rows or props was 16 in. which kept the face within the required distance of 5 ft.

MR. W. H. FLEMING said it would be interesting to know to what extent successful ploughing was due (*a*) to the fact that the Anbauhobel plough was driven simultaneously by independent drives at each end of the conveyor whereas the Loebbe Hobel plough was pulled alternately towards each end of the conveyor by a sprocket driven through a compressed air multi-disc clutch by a chain drive from the conveyor gear box; and (*b*) to the fact that the Anbauhobel was fitted with the new hard coal plough type LH 329, fitted with swivelling pre-cutting kerving bits, which could also have been used on the Loebbe Hobel unit.

As the Loebbe Hobel plough was driven from the gearboxes which also had to drive the conveyor chain, it would have been thought that stalling of the plough was due to the fact that only a single drive was installed at the delivery end as compared with the double drive at the tail end of the conveyor. Slipping of the multi-disc clutch did not usually occur unless a plate was missing or the air pressure was too low.

The authors had stated that, due to frequent shearing of pins, the driving couplings were drilled to take an additional pin. It would have been interesting to know the shearing force of these, as pins of standard diameter were already available with shearing strengths of 15, 18, and 20 tons.

After the first three or four traverses of the face by the Anbauhobel, advance was restricted by taking alternate rams off pressure. MR. FLEMING asked if the authors thought that straight line advance would have been more efficiently obtained by reducing the ram pressure rather than by leaving alternate rams on full pressure and whether this would have reduced the number of shear pin failures.

The AUTHORS replied that the Loebbe Hobel on 1s face suffered from both lack of power and clutch slip when attempting to plough from solid. The easing of the coal by the kerving bits had been an important factor in the success of solid ploughing on No. 2 unit. They thought that both the change of drive and the change of plough were necessary for the effective working of the No. 2 panel. The alteration of the pump pressure as opposed to taking off alternate rams would not have helped materially with the problem of excessive shearing as the major number of shears occurred in the first half of the shift. Pins with a 15-ton shear were used and a second one inserted to give strength plus a margin of security against damage.

MR. J. T. RYALL asked if it had been possible to make an assessment of the full potential of the plough in these circumstances. He also asked for comment on the waste-edge chocking system bearing in mind the fact that a free waste edge might assist the workability of the coal for ploughing. He also asked if it was possible to compare the large coal percentages figures with the yield from conventional faces in the same seam.

The AUTHORS said that owing to the short life of this unit and the need for blending with other seams at the washery and cleaning plant, no attempt had been made to exceed the output given in a single-shift working, but when faces in this seam had a potential of a much longer life, a faster rate of travel would be made. From the experience on No. 1 face, it was considered that a greater density of support would create stable and secure conditions and also assist in preventing roof movement from the goaf. Also there would be no excessive loading of supports by attempting to hold an excessive amount of goaf roof. The chocks were put in solely to prevent any excess of waste edge movement and to prevent undue loading of the other supports. The figures of large coal for No. 1 Beeston Seam when the coal was extracted by orthodox conveyor methods were as follow:—Over 6-in., 10.3 per cent.; 6-in. to 4-in., 5.5 per cent., and 4-in. to 2-in., 13.2 per cent.

MR. H. SAUL said that the face produced coal on one shift only. St. John's was a reconstruction pit and reconstruction work was still in progress. The area in which the plough was now working was very limited, but when development was completed in the Beeston Seam there would be longer runs for the installation. It was probable that in three or four years it may be possible to increase daily production.

MR. J. L. DAVISON asked if some of the success and better roof conditions at No. 2 face could be attributed to the fact that it was moving away from the fault. With regard to shotfiring, he asked why there were two shotfirers on No. 2 face and only one on No. 1 face.

Replying, the AUTHORS said although the area of coal now being worked would be regarded as normal seam conditions, they did not think that the 180-yd. fault on the right side of No. 1 face greatly influenced conditions on the No. 2 face. They thought that the improved conditions obtained on No. 2 face when cuts of shorter depths were taken, indicated that solid ploughing would have been equally successful, especially after the turn of the face when the face was put 30 deg. from "end."

An approximate estimate of the removal of top coal was that 60 per cent. was got down with air picks without difficulty and the rest by shots which did not, it must be admitted, create full time work for two shotfirers, even with the addition of the ripping shots. The main reason for two shotfirers was that in view of the increasing use of the plough and other types of mechanized faces that were envisaged at St. John's, the younger element of officials should be given as much time as possible on these faces to take charge of other faces at later dates.

MR. W. H. FLEMING referring to the thickness of seams suitable for certain types of mechanization, said the plough would operate efficiently in seams of 18 in. thick and he had personal experience with one of the earlier Loebbe Hobel which operated satisfactorily in a 22-in. seam at Dinnington Colliery in the Northern (N&C) Division of the NCB.

Seams of any thickness could be ploughed if there was a good parting from the roof and the top coal would follow, but where it was necessary to cut the top coal, the maximum height of the plough, including a top knife, was approximately 3 ft.

MR. C. APPLEBY asked, in view of the experience that the authors had now had with the plough installation, if they would consider ploughing solid coal on "end." He also asked if there were any dirt bands in the bottom part of the seam.

The AUTHORS replied that at No. 1 face, they thought that when the face was turned through 30 deg. there was the possibility of ploughing solid coal. They were convinced that with a different plough and drive, it would have been successfully accomplished. The attempt made was not altogether unsuccessful, but results were not so satisfactory as ploughing cut coal. Given the right plough with kerving bits and a positive drive, "end" coal could be successfully ploughed. The bottom part of the seam was almost free of dirt bands.

COMMUNICATIONS DISPLAY BY CANAL

USING Britain's 1,400 miles of inland waterways to take its products to potential customers for display, Communications Systems, Limited, Norfolk Street, London, W.C.2, a subsidiary of the Automatic Telephone & Electric Company, Limited, has converted the almost derelict narrow boat Taplow into a waterborne showroom containing working installations of much of its equipment.

The showroom, recently opened by Mr. F. J. Erroll, Minister of State, Board of Trade, is 22 ft. long by 6 ft. wide and the display includes centralized telephone dictation recording equipment, mining telephone systems, loudspeaking intercommunication systems, and clock systems controlled by a crystal chronometer.

The telephone dictation recording system enables letters or messages to be dictated onto a centralized bank of tape recorders by using internal desk telephones. Also in the showroom is a working installation of the type 58 private automatic telephone exchange, which, in conjunction with intrinsically safe automatic/magneto operated telephones, is designed to work in collieries.

The Taplow, 70 ft. long and powered by a 12-h.p. diesel engine, has been moored at Little Venice, Paddington, before setting off along the Grand Union Canal for a three-year journey which will take her to most of the industrial centres of the Midlands.

COMPILED FROM ANSWERS to a questionnaire sent to the 37,000 members of the Institute of Directors, the "Export Assistance Register" was published recently. Manufacturers seeking advice on their export projects will find it in the register, for it contains the names of some 600 companies, manufacturing 500 different main categories of goods, all of whom have offered export assistance to non-competing concerns. The register is published by the Institute of Directors' Export Action Now Committee.

Geology of Northern Ireland

A MEMOIR on the "Geology of the Country Around Dungannon," the first of a series which will describe in detail the geology of Northern Ireland, has been published for the Government of Northern Ireland by the Stationery Office (price £1 10s.). Although much of the subject matter is of academic interest, the economic implications of the geology are discussed at some length.

The memoir summarizes the mining activities which took place in the past in the Tyrone coalfield and describes in detail the many coal seams wrought at Dungannon and Coalisland. The work of resurvey was aided by several deep boreholes drilled to prove the eastern extension of the coalfield beyond Coalisland. The results show that no coal of economic importance occurs here, but much new information was gained about the Lough Neagh clays.

The publication also tells how the early promise of a deposit of gypsum to the north of Stewartstown was not borne out by further borings.

This memoir is the first publication of the Geological Survey of Northern Ireland, which was set up under the Ministry of Commerce in 1947. Before this—apart from some districts around Belfast and Londonderry and the Ballycastle coalfield, which were surveyed just before and after the first war—the last systematic geological survey of Northern Ireland was carried out about 90 years ago.

The main task of the Geological Survey is a systematic resurvey of the whole area, always bearing in mind the possible economic use of any of the material examined. New geological maps on the scale of 1 in. to the mile and descriptive memoirs will be published as the work proceeds. Another duty of the Geological Survey is to supply geological information when required to various Government departments, and another, little known, part of the service is the availability to any member of the public for consultation of a complete set of maps and memoirs on the geology of Northern Ireland.

New Approach to Control of Dust Diseases

Problem of reproducing fully satisfactory sets of standard radiographs of the chest came to the fore with the establishment, in 1958, of a new international classification for the radiological appearances of pneumoconiosis. The need for an international classification providing a uniform basis of comparison has long been felt. A meeting of experts on pneumoconiosis at Geneva succeeded in establishing a single international classification for the radiological appearances of all the pneumoconioses caused by mineral dusts. Standard films illustrating the various radiographic appearances defined in the classification were recognized as necessary and have now been produced and are being issued by the International Labour Office, Geneva.

New Literature

SOME of the house magazines, catalogues, booklets, and other publications received are referred to below. Readers wishing to obtain a copy of any of the items should write to the address given, at the same time mentioning this journal.

MOBIL OIL COMPANY, LIMITED, Caxton House, Tothill Street, London, S.W.1—The June issue, the latest number to reach us, of the Mobil Industrial Review is devoted to a survey on plastics.

PYRENE COMPANY, LIMITED, Metal Finishing Division, Great West Road, Brentford (Middx)—The July/August issue of the Bonderizer, a four-page leaflet, marks the tenth anniversary of publication.

EFCO FURNACES, LIMITED, Queens Road, Weybridge (Surrey)—"Electrode Salt Bath Furnaces" is the title of a new brochure (publication R1), which describes in considerable detail the wide range of the company's equipment in this field.

BRITISH STEEL FOUNDERS' ASSOCIATION, 13, Broomgrove Road, Sheffield 10—"Better Buy Steel Castings" is the theme of a new leaflet. It poses such questions as: "Have you made sure?" and "Can this sort of saving be made on your components?", and the reader is invited to "take your steelfoundry engineer into your confidence and let his experience help."

UNION CARBIDE, LIMITED, 8, Grafton Street, London, W.1—"Union Carbide Ferro-alloy Briquettes" (publication No. 150A), an attractive new leaflet, points out that nowadays the ironfoundry industry appreciates the advantages of ferro-alloys in briquette form. A new range of Union Carbide briquettes was marketed in March of this year, when the modern plant went into production at the Glossop Works.

HEAD WRIGHTSON STOCKTON, LIMITED, Norton Road, Stockton-on-Tees—This company, which grew up with the mining industry, has, for over 60 years, specialized in the design and manufacture of equipment for chemical plants and iron and steel works in addition to its more traditional lines. The comprehensive services offered by the company are outlined in a handsome brochure "Design and Fabrication for Heavy Industry."

CROSSLEY BROS., LIMITED, Openshaw, Manchester 11—This year the Southampton, Isle of Wight & South of England Royal Mail Steam Packet Company, Limited (more generally known as Red Funnel Steamers, Limited), celebrates its centenary. Crossley machinery has played an important part in the growth and development of Red Funnel Steamers, and the latest (No. 218) issue of Crossley Chronicles tells the story in words and pictures.

MIDDLESEX PREFABRICATED BUILDINGS, LIMITED, Green Lane, Hounslow (Middx)—This company's prefabricated buildings are being used extensively in industry. A new leaflet, "Middlesex and Industry," gives details and illustrations of some of them. Imperial Chemical Industries, Limited, and Head Wrightson Stockton, Limited, are among the companies using these buildings.

INSTITUTION OF WORKS MANAGEMENT, 196, Shaftesbury Avenue, London, W.C.2—Main feature of the August issue of Works Management (2s. 6d., by post 3s.) is "What British Trades Unions Expect from Management," an address given by Mr. W. J. Carron, president of the AEU, at a recent international conference organized by the institution on the theme "The Role of Management in Industrial Relations." The subsequent discussion is also reported.

MACCARTHY & COMPANY (ENGINEERS), LIMITED, 15, Sandhill, Newcastle-upon-Tyne 1—The effective degreasing of machine parts has always been a problem and, after considerable research, the company has produced the "Cascade" degreasing and washing plant, which is claimed to be both reasonable in first cost and economical to operate. "But This is a *Clean* Story" is the title given to a leaflet describing and illustrating the "Cascade" plant in some detail.

REINFORCED CONCRETE ASSOCIATION, 94/98, Petty France, London, S.W.1—The 1961 edition of the "Directory of Members," now available, lists the ordinary members of the association under the headings of professional and industrial, the latter, in turn, being broken down into classified lists. Other information about the association is also given, making the directory a useful reference work for those concerned with the erection of new buildings and engineering structures.

NATIONAL COAL BOARD, Hobart House, Grosvenor Place, London, S.W.1—Latest stage of an inquiry which a joint study group from the NCB and the Gas Council is making into the development of the Lurgi gas-making process is that four East Midlands sites are being investigated to see if they are suitable for a vast gas-from-coal plant needing a million tons of coal a year. This is the subject of the front-page lead story in the August issue of Coal News (3d.), which made its début in July. Each of the nine editions covering the various Coal Board divisions contains four pages of local news.

EDGAR ALLEN & COMPANY, LIMITED, Imperial Steel Works, Sheffield 9—The company has been manufacturing materials for magnetic purposes since the early 1890s. The range of products in this class includes magnetically hard materials or permanent magnets; magnetically soft or high-permeability materials, and materials for special applications, e.g., for temperature compensation for magnet systems ("thermomagnetic" materials) or for locations where steels of low magnetic permeability ("non-magnetic" steels) are necessary. The first of a series of articles on "Magnetic Materials" appears in the August number of Edgar Allen News.

CAMBRIDGE INSTRUMENT COMPANY, LIMITED, 13, Grosvenor Place, London, S.W.1—List 325 describes the company's standard range of rare- and base-metal thermocouples for temperatures up to 1,500 deg. C. In general, thermocouples are manufactured to customers' specifications and for particular applications, but certain types of thermocouple assemblies are now produced as a standard range. Another new list (281/2) describes magnetic oxygen meters, developed for the determination of oxygen concentrations using methods based on the high paramagnetic susceptibility of the gas. The fact that all other common industrial gases, with the exception of nitric oxide, are diamagnetic enables accurate oxygen analysis to be carried out. Two types of instrument are available.

BRITISH IRON AND STEEL FEDERATION, Steel House, Tothill Street, London, S.W.1—The British steel industry is engaged upon a programme of unprecedented technical innovation and expansion. Many companies are involved in the gigantic programme, which is clearly detailed in "Steel in the 1960s: Developments by the Companies," a 48-page booklet issued by the federation. The programme of expansion and modernization is outlined in the introduction and detailed in the two parts into which the publication has been divided—"Major Developments" and "The Implications of the Programme." Many of the illustrations are in colour. "Steel in the 1960s" is an excellent record of the industry as it exists today and as it is expected to develop.

FEWER KILLED IN NORTH-EASTERN MINE ACCIDENTS

But Inspector Refers To a "Disturbing Factor"

Satisfaction that the number of 46 persons killed during the year was 22 less than in 1959 is expressed by Mr. H. J. Perrins, HM Divisional Inspector, North Eastern Division of the Mines Inspectorate, in his annual report for 1960 (Stationery Office, price 3s.). The number of persons killed by accidents from falls of ground accounted for more than half of the total fatalities, however, and this the Inspector refers to as "one disturbing factor."

FROM the 128 coal mines under the Mines and Quarries Act, 1954, working at the end of the year, the output of saleable coal was 40,705,140 tons, which was a decrease of 1,546,078 tons on the 1959 figure. Total number of persons employed at the year end was 119,388, a decrease of 8,694 compared with 1959.

The proportion of the output produced by fully mechanized means again increased slightly during the year, the Inspector states. Progress was made with the various surface and underground reorganization schemes and some new ones were started.

TABLE 1.—*Persons Killed or Seriously Injured in the North Eastern Division at Coal Mines Working Under the Mines and Quarries Act, 1954, During the Year 1960, Compared with the Average for 1957-59.*

Classification of accidents.	Killed.		Seriously injured.	
	1960.	Average 1957-59.	1960.	Average 1957-59.
UNDERGROUND				
Falls of ground				
(*a*) Falls of roof at face ..	10	8·6	32	42·7
(*b*) Falls of face or side ..	1	1·7	35	35·3
(*c*) Other falls	15	13·3	32	44·0
Total falls	26	23·6	99	122·0
Haulage and Transport ..	6	13·3	71	72·7
Miscellaneous causes	8	15·7	61	75·7
Total underground ..	40	52·6	231	270·4
Surface	6	6·0	33	34·3
Surface and underground	46	58·6	264	304·7

Accidents and Their Prevention

Regarding accidents and their prevention Table 1 gives the numbers of persons killed or seriously injured at coal mines during the year, and the average for the preceding three-year period for comparison. The number of persons killed totalled 46, against 68 for the previous year and compares with an average of 58.6 for the preceding three-year period. The number seriously injured was 264, against 281 for the previous year and compares with an average of 304.7 for the preceding three-year period.

At the end of 1959 grave concern was felt because the number of persons killed during that year was the highest since 1949. There had been 10 deaths in three underground explosions and also a serious increase in fatal accidents by falls of ground; the latter total amounted to just less than a quarter of that for the whole country. As would be expected, towards the end of 1959 and early in 1960 a great deal of thought was given by all parties concerned as to the best means not only of checking the rising accident trend but of reversing it.

Expressing satisfaction that the number of 46 persons killed during the year was 22 less than in 1959, the Inspector states that the deaths underground at 40 were also 22 less than those for the previous year and the second lowest ever recorded. Moreover the combined total of persons killed or seriously injured at 310 was the lowest ever recorded for the division. A detailed analysis of the fatal accidents, however, brings out one disturbing feature, namely, that the number of persons killed by accidents from falls of ground accounted for more than half of the total fatalities. Table 2

TABLE 2.—*Showing Incidence of All Accidents in the Three Districts Forming the Division.*

District.	Killed.		Seriously injured.		Total.	
	1960.	Average 1957-59.	1960.	Average 1957-59.	1960.	Average 1957-59.
West Yorkshire (Wakefield) ..	13	21·3	84	84·7	97	106·0
South-east Yorkshire (Doncaster)	19	24·0	111	121·7	130	145·7
South-west Yorkshire (Rotherham)	14	13·3	69	98·3	83	111·6
TOTAL ..	46	58·6	264	304·7	310	363·3

shows the incidence of all these accidents in the three districts which form the division.

Accidents by Falls of Ground

Although the Inspector is pleased to record a decrease in the numbers of persons killed or seriously injured by falls of ground, the figures are disproportionately high when compared with those for the rest of the country. Twenty persons were killed and 88 seriously injured on longwall faces; there were no fatalities, but three were seriously injured in narrow work, and six were killed and seven seriously injured by falls on roads. An analysis of the provision or condition of the supports concerned in each accident showed that six persons were killed and 49 seriously injured in ground which was unsupported, one was killed and 13 were seriously injured by falls which took place between supports, one was killed and two were seriously injured due to broken supports, 13 were killed and 26 seriously injured because the supports were otherwise ineffective, and five were killed and nine seriously injured during support withdrawal operations.

Citing operations or places more prone to accidents than others, the Inspector mentions:—(1) Snaking conveyor systems and places where supports have to be taken out and reset such as at roadhead transfer points, stable holes, and where machinery has to be turned or advanced; (2) places where supports have to be removed so that roof can be taken down and new supports erected such as at all face and back ripping lips and where there are faults or geological features of an unusual nature at the working face; (3) places where persons, who usually work alone and are given only occasional supervision, venture under roof which is not secured by supports set in accordance with the Support Rules such as at the coal face ahead of the most recently set supports or in the waste behind the back row of supports.

He wishes that every man contemplating venturing under any roof which is not so secured would remind himself that a stone of any size falling from a height of 4 ft. reaches the floor in about a quarter of a second and such stones, if they give no prior warning—and very few do—just cannot be avoided. Personal responsibility and self-discipline undergo their biggest test at these places and the prevention of accidents at them presents a challenge to every man.

The total casualties of 11 killed and 67 seriously injured at face workings during 1960 were down on 1959, but were approximately the same as for the year 1958. Ten of the 11 deaths at the coal face were by falls of roof. The 11th was due to a fall of side which occurred where the shearer machine was being used to work the lower portion of a thick seam, the top coal being expected either to fall behind the machine or to be pulled down by hand. Unfortunately, a piece remained up and was left unsupported and when it fell without warning it fatally injured a deputy who was travelling, contrary to the Support Rules between the front row of props and the face. The accident illustrates the dangers which can arise from the lack of co-ordination between the processes which make up coal-getting. In the prop-free-front system of working the pattern of supports allows little latitude and any departure from the defined sequence of operations gives rise to difficulties. In some of the 10 fatal accidents due to falls of roof there was a lamentable depreciation in the standards that must be observed if safe working conditions are to prevail. For instance, one man knocked out, quite irresponsibly, a series of props in order to advance a conveyor tray. Another foolishly exposed himself to the danger of a roof fall while cutting at a single wood prop with an axe. Another was working 7½ ft. ahead of his last set of supports.

Of the fatal accidents at roadheads, four occurred ahead of the ripping face and were thus not affected by the actual process of taking down roof. In each case, the accident was the result of an extensive fall of roof and on the evidence available, support to the roof previous to the fall taking place was judged as complying with the Support Rules in essentials. As compared with the previous year, the number killed in wastes was one less, but five more were seriously injured.

Self-advancing Supports

The use of self-advancing supports on power-loader faces extended during 1960 and at the end of the year 10 such installations were at work; two others had been discontinued because of difficult operational conditions. There is little doubt, states the Inspector, that where the roof and floor are suitable, the use of these supports can provide the early and effective support which is required behind fast-moving power-loading machines, but, if the roof or floor are unsuitable then the use of the supports can lead to an even further deterioration in the roof conditions. This was the cause of a failure in a seam 8 ft. thick, of which 2½ ft. was retained as a roof. The face, 200 yd. long, had been originally supported by friction-type props set to link bars on a triangular system with waste packs 4 yd. wide and 7 yd. apart. At the time the self-advancing supports were introduced there was excessive prop penetration into the floor, considerable convergence and severe fracturing accompanied by much guttering of the roof coal in the face area. The conditions deteriorated even further during the period the self-advancing supports were in use.

The advancing of the chocks at all times presented difficulties due to the disintegration of the roof; the consequent need to pack up the cavities, and the flushing of the fallen material from the waste into the face area, the building of waste packs having been discontinued. These difficulties were never surmounted and the self-advancing supports had to be withdrawn in order to reintroduce strip packing. This failure confirmed previous experience that the success of a self-advancing support system depends largely on the strength of the roof and its ability to remain substantially unbroken between the face and the waste edge.

Much care and thought should be given before a decision is taken to install a system of self-advanc-

ing supports. Sufficient experience has now been gained for it to be fairly clear that they have not the magical property of making a tender roof into a strong one, but they can, and conceivably do, make a good roof into an even better one. An important point with regard to their use must always be borne in mind, namely that they cannot conveniently be used in conjunction with strip packing, so that the alternative is either to solid stow or to cave. With regard to the latter, they should only be used in conditions which have been proved as suitable for caving and preferably where caving is actually established.

Power loading is demanding more than ever the use of armoured conveyors with twin motors to drive them. These are usually positioned opposite the main roadhead where, of necessity, there has to be a stable thus calling for the support of a fairly large area of roof. The problem of supporting such an area, where many supports have to be disturbed to allow the machinery to be advanced, has led to the development of a self-advancing support system solely for roadheads. The system is, in fact being tried out at the main roadhead of a slicer face in the Silkstone Seam at Elsecar Main Colliery. The seam is 5 ft. 6 in. thick and the roof and floor conditions are good. The system is designed to span the twin motor armoured conveyor drivehead and allow it to be moved forward with a minimum of disturbance. It comprises four parallel frames each of which is supported by hydraulic props and can be advanced independently by means of rams. A hydraulic power pack in the gate, provides oil at 2,500 lb./sq. in. This gives a maximum setting load of about 9 tons per prop and a horizontal thrust of 7 tons per ram, but pressure-reducing valves are fitted in the prop and ram circuits so that any lower pressure, as found suitable, may be used.

The props yield at 20 tons load and the maximum advancing stroke of the gearhead is 2 ft. 3 in.

During the year extensive underground trials were given to lightweight steel bars designed by the Safety in Mines Research Establishment and the Mining Research Establishment of the National Coal Board. Both types of bar were used at the main roadheads of double-unit faces at Brookhouse and Rossington Main collieries. The results indicated that the lightweight bars gave more efficient service than the girders which were normally used under similar conditions. Plans have been made for the introduction of the Safety in Mines Research Establishment type of bar on a much larger scale.

Compressed-air Blasting Devices

It is approximately five years since the first compressed-air blasting device was introduced in this division and the advantages of a reduced explosion risk and an increase in round coal led to 23 installations serving 42 faces at 18 collieries by the end of the year. The use of very high air pressure for this purpose, however, has introduced new hazards and during the year three persons were seriously injured in connection with its use.

In one accident a shotfirer was leaning over the firing valve preparing to fire a shell when the flexible hose fractured at its coupling into the valve; the escaping high-pressure air caused an injury which resulted in the loss of an eye. Better maintenance and more careful examination of the equipment might have avoided the accident. In another, a shotfirer firing a shell operated the key on the firing valve, but nothing happened. He then disconnected the valve which he had left slightly open and the release of air severely injured his hand. He was inexperienced and had not been properly trained in the use of the equipment. The third accident was to a filler who received serious abdominal injuries when the airbreaker shell which, with hose attached, the deputy was carrying along the face, suddenly discharged. The accident was due to carelessness. A shotfirer who had just finished using the equipment had discharged it, but left the shooting valve open. At the same time the valve on the main range was closed. Later, while the deputy was carrying the equipment along the face, air was again admitted to the range and thus to the shell which thereupon discharged. The blast struck the filler. Shooting valves from which it is impossible to remove the key unless the valve is closed are available and should be used.

Underground Fires

Fourteen underground fires were reported during the year. Several originated as the result of heat developed by friction on belt conveyors, but they were discovered before they had become well established and were extinguished by means of the fire-fighting materials which were to hand. In one instance an overman detected smoke when descending the upcast shaft at the beginning of a weekend shift.

On investigation he found that in the loader gate of a conveyor system some two miles inbye small coal and dust underneath the conveyor were burning. The fire was extinguished in about four hours. The p.v.c. belting was severely charred. The conveyor had been standing for at least 27 hr., indicating that heat generated by the belt rubbing in the accumulated dust had given rise to an incipient heating which developed into fire. Having regard to the length of time that the belt had been stationary, the Inspector points out it can clearly be seen that, to obtain immunity from incidents of this kind, examination of conveyors must not be confined to an hour or so after stopping. The use of fire-resistant belting played an important part in confining the fires reported during the year to minor proportions.

Hot metal resulting from the use of an oxy-acetylene burner fell down a shaft and started a fire on a wooden platform. Permission to use the burner had been granted subject, among other things, to all inflammable surfaces being covered and thoroughly saturated with water. If those precautions had been fully observed there would not have been a fire.

Two fires were caused by electrical short-circuits,

one in a drill cable and the other in a cutter cable, but the damage was confined to the cable in each case and the fires were promptly extinguished. The cutter cable had developed a fault which tripped the switch in the gate-end box, but the operator of the machine, thinking that the fault lay in the switch, coupled his cable to an alternative source of supply and the resultant flash to earth caused a small fire.

Every horse, in the 57 mines of the National Coal Board in the division and one licensed mine, was examined at least once during the year in the 124 underground inspections and 291 surface inspections. Employment of horses in the division shows a continued decrease in numbers with a total at December, 1960, of 1,215. The health of the horses in general has been maintained except for small epidemics of influenza and bronchitis. In two instances the epidemic was controlled by isolating the initial cases, but in a third instance isolation facilities were not available and the infection spread to all the horses underground at that mine; despite the attention of a veterinary surgeon, two horses died.

There were no cases of glanders or strangles reported and in general the standards of stabling and feeding were satisfactory.

A training and breaking centre in No. 7 Area was moved to Sharlston Colliery and continues to render an admirable service in training horses for work, thereby lessening the risk of accidents. In the same Area some provision is being made for isolation stables at the surface, one for each group of mines. Three new underground stables were completed during the year and four more are planned.

NEW RANGE OF *Rotary Excavators in USSR*

DETAILS have been received of a new range of rotary excavators in production, or shortly about to be so, in the USSR. The smallest excavator, the ERG 350/1000, illustrated below, is claimed to be capable of mining 1,300 cu. yd. of earth or ore in an hour.

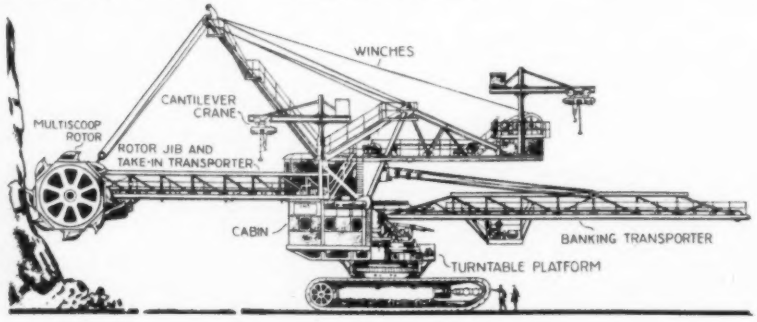
The rotor, measuring 20 ft. in diameter, is lowered by a cantilever crane to the foot of the face to be excavated, and undercuts it in a wide arc, controlled by the movement of the turntable platform. The excavated material falls onto the take-in transporter and is transferred to the banking transporter, which, in turn, dumps it wherever required.

The rotor is lifted after each traverse, thus cutting a new tier, above the one which has just been excavated. The complete excavator is moved forwards on its crawler tracks.

The next excavator in this range, with an hourly capacity of 4,000 cu. yd., is already in construction at a factory in Novo-Kramatorsk, and is expected to be working by the end of this year at the manganese orefield at Nikopol. One still larger, with an hourly capacity of 8,000 cu. yd., is as yet still on the drawing board, but is scheduled for completion in 1963.

Manufacture of Coal Washeries in India

Indo-British-American co-operation is to result in the manufacture of coal washeries and coal-handling plants at Kumardhubi, in Bihar. Promoter of this venture is the McNally-Bird Engineering Company (Private), Limited. The major portion of the finances will be provided by the American participants. At the outset it is proposed to manufacture 70 per cent. of a coal washery in India; in about five years' time it is expected, depending on the equipment that can be purchased locally, to manufacture washeries almost entirely in that country.



THE RUSSIAN ERG 350/1000 ROTARY EXCAVATOR WITH A CAPACITY OF 1,300 CU. YD./HR.

OXY-FUEL STEELMAKING PROCESS

Rapid Growth Foreshadowed

HIGHER and higher rates of oxygen flow and greatly increased firing rates may result in modification to the open-hearth furnace to utilize its maximum capabilities, state E. F. Kurzinski, manager, and R. D. Jones, development engineer, respectively, of the applied research and development division of Air Products, Inc., Allentown, Pa., in the introduction of an article* on "Oxy-fuel Processes Increase Steelmaking Rates."

They proceed to point out that basically, oxy-fuel processing is a marriage of the combustion practices of the open-hearth furnace and the faster charging and high oxygen input rates of the newer basic oxygen furnace.

Results of experimental heats conducted in a number of open-hearth furnaces indicate that steel production increases of 400 per cent. are possible compared with non-oxygen, open-hearth heats, and increases of over 100 per cent. are possible as compared with standard oxygen practices for open-hearth furnaces today.

The purpose of the article which is summarized here is to present the latest data on oxy-fuel processing.

Early Development Stages

While these results are encouraging, the authors say it must be emphasized that the oxy-fuel process is still in the early developmental stages and does not warrant the considerable publicity given it. But the so-called "trick heats" made with oxygen roof lances at the Corrigan-McKinney Works of the Republic Steel Corporation and other mills during the years 1946 to 1948 should not be discounted for they are the production practices today; and it is probable that the oxy-fuel heats of today will be the production standard of "tomorrow," which may occur sooner than the dozen years which elapsed between the development and widespread use of oxygen roof lancing.

Oxy-fuel Process

The oxy-fuel process incorporates many factors for optimum application in addition to the controlled combustion of oxygen and hydrocarbons. These factors may be summarized as follow:—

(1) High-capacity burners should be used. At present, heat is supplied by oxygen-enriched conventional end burners augmented with oxy-fuel jets, or oxygen-enriched conventional burners alone. In the future, oxy-fuel jets may supply the total heat requirements, eliminating conventional end burners. This will result in greater heating efficiency and added flexibility. Heat input rates will be considerably higher than the maximum firing rates used today. The combination of greater heating efficiency and increased firing rates will result in significant acceleration of the open-hearth process.

(2) Rapid cold material charging is a basic requirement since the high heat-input rates used with oxy-fuel processing are of maximum value only when sufficient cold material is available to absorb the energy released.

(3) Immediate hot-metal charging has proved highly effective in a large number of experimental heats. These heats have shown that the conventional scrap melt-down period is unnecessary. Hot metal should be added immediately after completion of the cold charge, allowing a short interval for banking doors. For maximum effectiveness, the heat-input rate during charging should be such that the heat energy in the scrap, plus that available from the oxidation of the iron metalloids, is sufficient to bring the steel to tap temperature without further addition of fuel to the furnace. By charging hot metal earlier than normal, observations indicate that a portion of the hot metal temporarily freezes at the bottom of the furnace. Care should be taken when using gas-forming materials such as limestone in the charge. If such material is trapped under the frozen layer, the gases evolved could be released suddenly causing a violent reaction with risk to furnace equipment and personnel.

(4) Cold charge composition should be adjusted depending on the market value of raw materials. The high heat input rates available with oxy-fuel processing indicate that the percentages of scrap, iron ore, and hot metal can be varied considerably with a minimum effect on heat time. This flexibility should result in lower materials cost.

(5) Injected furnace additions should be used rather than bulk additions. Iron ore, mill scale and fluxes should be injected through the oxy-fuel jets. This practice will provide excellent control of

* Iron and Steel Engineer, Feb., 1961.

materials, reduce heat losses, and increase the effectiveness of the additions.

(6) Immediate oxygen injection is of primary importance and oxygen refining should begin immediately after the addition of hot metal.

(7) Increased oxygen usage over standard oxygen practices is required. Higher oxygen flow rates, generally over 45,000 cu. ft./roof lance, multiple oxygen roof lances, and oxygen consumption of about 1,500 cu. ft./ton of steel make possible maximum steel production rates. The lances should be positioned below the slag surface to minimize slag and metal splashing.

SWEDEN EXPANDS STEEL PRODUCTION

SWEDEN's industrial production in 1960 reached a new peak, showing a volume increase of 8 per cent. on 1959. This is the largest increase for any year over the past decade and compares with a rise of 3.7 per cent. in 1959, 1.8 per cent. in 1958, and 6 per cent. in 1955. The average annual increase over the past 10 years is 3.4 per cent.

Iron-ore mining rose by 17 per cent., production in the steel and other metal manufacturing industry was up by 9 per cent., and unemployment in the engineering industry rose by 7 per cent.

Sweden's steel production totalled 2,800 tons in 1959, or double that in 1950, Mr. Ragnar Sundén, head of the Swedish Ironmasters' Association, indicated in a recent speech. In 1960 the output showed a further increase to 3,200,000 tons. The rate of increase during the past decade paralleled that in the European Coal and Steel Community, but was somewhat slower than in the Soviet Union, Mr. Sundén said. Over the period 1959-60 steel output is estimated to rise by 63 per cent.

Swedish steelworks plan to invest an aggregate average of Kr. 330,000,000 per annum in new plant and machinery in the first half of the 1960s, the figure for the latter half of the decade being Kr. 250,000,000 per annum. In both cases, the figures are lower than the average for the past two years, which was Kr. 400,000,000 (£27,600,000). Most of the new investment in the steelworks will be used to expand the capacity for producing steel by the oxygen method. It is estimated that the oxygen process will account for 22 per cent. of the output in 1965, as compared with 4 per cent. in 1959.

"THERE ARE 1,000,000,000 tons of coal in West Bengal, if only we can resort to deep mining," says Dr. B. C. Roy, Chief Minister of West Bengal. Dr. Roy, who went to Poland recently to examine coal-mining machinery in that country, is also investigating plans for high-pressure gas from coal in Czechoslovakia before returning home.

Chain-grate Stoker Installation

INSTALLATION of 28 chain-grate stokers was recently completed at the Grimsby works of British Titan Products, Limited. The equipment was supplied by John Thompson (Triumph Stoker), Limited, a member of the John Thompson group.

The steam-raising plant comprises 14 self-contained Economic boilers, each rated at 13,400 lb./hr. from and at 212 deg. F., at a working pressure of 150 lb./sq. in. Two groups of five boilers discharge the products of combustion into a common chimney and a further group of four boilers discharges into a separate chimney. A gilled-tube economizer is incorporated with each group of boilers, a superheater and induced-draught fan being fitted with each boiler.

To meet the requirements of the Clean Air Act, various types of firing equipment were considered as an alternative to the sprinkler stokers originally installed. Chain-grate stokers were chosen—giving full boiler rating and eliminating excessive smoke emission. At the same time an additional economic advantage was offered by the ability of the chain-grate stoker to use a cheaper fuel, Brodsworth washed smalls, in place of the washed singles which was used on the original installation.

THE BOILERHOUSE FIRING AISLE AT THE GRIMSBY WORKS OF BRITISH TITAN PRODUCTS, LIMITED. THE INSTALLATION COMPRISES 14 SELF-CONTAINED ECONOMIC BOILERS, INTO WHICH ARE FITTED 28 CHAIN-GRATE STOKERS.

Separating Solid Suspensions

New 300-mm. dia. Hydrocyclone.

IN order to meet a demand in a variety of industries for a speedy and accurate method of separating or classifying solids suspended in a liquid, a new device known as the Hydrocyclone has been produced. This is a wet centrifuge in the form of a cylindro-conical vessel into which the liquid to be processed is injected under pressure. The rapid rotary motion which is imparted to the liquid produces a very high centrifugal force, frequently of 15,000 g. or more, which forms two distinct vortices. The outer vortex carries the heavier solids to a nozzle in the apex of the instrument from which they are discharged together with some liquid. The lighter solids are entrained in the inner vortex to an axial overflow at the opposite end.

Owing to the strong forces produced, the Hydrocyclone is effective even with pulps of high solid concentration or plasticity. Its ability to distinguish between granular particles and those which settle by means of flocculation or other form of aggregation makes it particularly useful for cleaning such difficult materials as fibrous pulps.

The Hydrocyclone is of simple construction and consists of a body, normally of cast aluminium or fabricated mild steel with a lining of special abrasion resistant rubber. The upper part contains the vortex finder and overflow and an easily removable nozzle of solid rubber is fitted to the apex. To provide maximum protection against abrasion, which is intensified as the diameter lessens, the walls of the nozzle increase in thickness towards the orifice.

In the smaller sized units the rubber body lining is replaceable.

Under normal conditions the diameter of the Hydrocyclone selected for a particular application is dictated by the fineness of separation required, the smaller the diameter the finer the separation and this can be controlled by varying the diameter of the three orifices. The apex nozzle controls the proportion of feed volume rejected as underflow and consequently determines its solid concentration. The fineness of separation can also be increased by recycloning the overflow and the sharpness, that is to say, the efficiency of separation, by recycloning the underflow.

Two other factors which affect the size of separation are pressure, the increase of which usually produces finer separation, and feed dilution. Some separations are, however, possible with pressure drops as low as 2 lb./sq. in., often obtainable by gravity.

The Hydrocyclone is produced in models with capacities ranging from 4 to 1,200 gal./min. For fine separations at higher capacities batteries of Hydrocyclones of 15 or 30 mm. dia. can be installed. In suitable cases separations down to 5 microns are possible.

This unit is being used extensively in laboratory research and among its many potential applications in various industries the following can be mentioned:—Degritting of cutting, grinding, and honing fluids and of rolling-mill cooling water; dewatering of slurry; desliming of sand as well as degassing, deflocculation, and general classification and washing operations.

The instrument described is manufactured by Liquid-Solid Separations, Limited, 2, Anderson Street, London, S.W.3.

British and World Shipbuilding

LLOYD'S REGISTER RETURNS FOR JUNE QUARTER

STEAMSHIPS and motorships of over 100 tons gross under construction in Great Britain and Northern Ireland at the end of June, according to Lloyd's Register shipbuilding returns, totalled 241 ships of 1,614,062 tons gross. This was 3,415 tons more than in the previous quarter, apart from which it is the lowest figure since December, 1945. The highest post-war figure was 2,345,408 tons at the end of 1957. The total comprises 96 ships of 623,404 tons fitting out afloat, and 145 of 990,658 tons still to be launched.

Commenced during the quarter were 57 ships of 341,092 tons; launched, 72 of 375,353 tons; completed, 64 of 841,918 tons. Vessels under construction included 38 steamships of 778,346 tons and 203 motorships of 835,716 tons. In Commonwealth countries there were under construction six steamers of 64,662 tons and 46 motorships of 141,095 tons. Oil tankers total 40 ships of 782,963 tons, which is 61,042 tons less than the March quarter, and represents 48.5 per cent. of the total tonnage under construction in this country.

Total construction in the principal districts is shown in Table 1.

TABLE 1.—*Shipbuilding Construction in Hand in Principal Districts of Great Britain and Northern Ireland.*

District.	June 30, 1961.		March 31, 1960.		June 30, 1960.	
	No.	Gross tonnage.	No.	Gross tonnage.	No.	Gross tonnage.
Aberdeen ..	11	8,265	13	13,710	19	9,236
Barrow ..	3	84,500	2	51,500	3	92,500
Belfast ..	9	135,500	12	228,189	12	217,762
Bristol ..	2	2,250	1	2,000	4	2,830
Clyde:						
Glasgow ..	41	341,618	47	323,179	51	464,720
Greenock ..	18	118,002	17	126,236	18	128,728
Dundee ..	3	9,400	3	12,400	4	22,744
Hartlepool ..	1	9,200	2	19,600	2	22,250
Hull	37	14,742	42	15,830	36	14,753
Leith	8	36,085	8	42,590	7	43,050
Liverpool ..	8	99,080	7	98,630	7	130,045
Middlesbrough	8	143,655	8	144,530	9	163,610
Newcastle-upon-Tyne	29	325,777	29	303,020	32	323,580
Southampton	4	2,875	6	7,263	11	10,979
Sunderland ..	25	275,790	22	214,654	23	214,114

Sizes of steamships and motorships under construction at the end of June in Great Britain and Northern Ireland included the following:—100 to 500 tons, steam nil (motor 86); 500 to 1,000 tons, steam nil (16); 1,000 to 2,000 tons, steam 8 (17); 2,000 to 4,000 tons, steam 2 (2); 4,000 to 6,000 tons, steam nil (13); 6,000 to 8,000 tons, steam nil (13); 8,000 to 10,000 tons, steam nil (25); 10,000 to 15,000 tons, steam 5 (24); 15,000 to 20,000 tons, steam 1 (6); 20,000 to 25,000 tons, steam 3 (1); 25,000 to 30,000 tons, steam 5 (nil); 30,000 and under 40,000 tons, steam 11 (nil); 40,000 tons and above, steam 3 (nil).

Abroad

Steamships and motorships being built abroad at the end of June totalled 1,259 ships of 7,184,421 tons, an increase of 69,207 tons since last quarter. As was then the case, no returns are available for China, East Germany, and Russia (USSR). After falling steadily from a peak figure of 7,906,658 tons in September, 1958, to 6,972,894 tons at the end of 1960, there has now been an increase of 211,527 tons in tonnage under construction abroad during the first half of this year.

Some of the countries abroad had the following tonnages under construction as compared with the March quarter:—Japan, 1,023,911 tons (−1,179); Germany (West), 864,262 tons (+27,236); Sweden, 832,131 tons (+2,075); Netherlands, 654,562 tons (+57,215); France, 591,859 tons (−17,419); USA, 591,534 tons (+86,299); Italy, 569,254 tons (−28,912); Norway, 413,774 tons (−30,044); Spain, 269,775 tons (−26,239); Poland, 262,326 tons (−22,240); Yugoslavia, 247,604 tons (−15,333); Denmark, 246,805 tons (−9,235); Belgium, 163,433 tons (+36,903); Finland, 104,399 tons (+21,030); Canada, 92,410 tons (−1,720); India, 56,937 tons (+3,412); Australia, 47,075 tons (−12,363). Changes in the relative positions of these countries illustrate the unsettled outlook for the shipbuilding industry in general and are not significant in themselves.

Oil tankers under construction abroad total 203 ships of 2,818,190 tons, which is 7,292 tons less than the March quarter, and represents 39.2 per cent. of the total tonnage being built abroad.

Apart from those countries already mentioned, there are under construction in the world 1,500 steamships and motorships of 8,798,483 tons, of which 18.3 per cent. is being built in Great Britain and Northern Ireland. The June total is 72,622 tons more than in the March quarter. The highest post-war figure of tonnage under construction in the world was 10,205,791 tons in September, 1958. Oil tankers under construction in the world amount to 243 ships of 3,601,153 tons gross (82 steamships of 2,411,848 tons and 161 motorships of 1,189,305 tons), which is 53,750 tons more than the previous quarter, and represents 40.9 per cent. of the total tonnage under construction in the world.

Of the steamships and motorships under construction throughout the world at the end of June, 4,351,727 tons (49.5 per cent.) are to be classed with Lloyd's Register. Of this total 1,549,891 tons, representing 96.0 per cent. of the tonnage being built there, are at yards in Great Britain and Northern Ireland.

Soviet Steel Advance

RISE OF 9 PER CENT. IN HALF-YEAR PRODUCTION

INCREASES in production of steel, rolling mill products, pig-iron and iron ore figure in Russia's increase in total industrial production of 8.4 per cent. in the first half of 1961, compared with the corresponding period of 1960, while a large rise in supplies of non-solid fuels resulted in a slight reduction in output of coal. Most categories of machinery made rapid progress, with investment in machine-building showing one of the biggest increases of 15 per cent.

Output of steel during the half year was 34,900,000 tons against 32,000,000 tons in the same period last year, a rise of about 9 per cent., while production of rolling mill products rose from 25,200,000 tons to 27,200,000 tons. Pig-iron output increased from 22,900,000 tons to 25,000,000 tons, while production of iron ore was 57,300,000 tons, against last year's half-year figure of 51,700,000 tons.

Coal production in the January to June period was 255,000,000 tons, compared with 257,000,000 tons last year, while output of electricity rose from 142,000,000 mlrd. kWh to 157,000,000 mlrd. kWh. There was a rise in output of machine tool units from 75,100 to 81,300, while production of forging and stamping machinery remained the same at 14,800 units. Cement production rose from 21,700,000 tons to 24,300,000 tons.

The overall increase in total industrial production of 8.4 per cent., while lower than has been achieved in recent years, was still slightly in excess of plan, and was achieved with a considerable reduction in hours of labour. An effect of this reduction was a rise in productivity of 3.5 per cent. on an annual basis, but by 11 per cent. an hour.

Swedish Nuclear Power Station Equipment

FIRST of the two heat exchangers to be manufactured by Jönköpings Mekaniska Verkstad for the Agesta nuclear power and heating plant, outside Stockholm, is being installed. Designed in collaboration with the Swedish Atomic Energy Company, the units are to operate between the reactor's primary cooling system, containing heavy water, and the secondary light-water system.

The temperature on the heavy-water side is 220 deg. C. and the operational pressure 33 atmospheres, which is transferred into saturated steam of 14 atmospheres on the light-water side. Each exchanger contains 12,500 metres (41,000 ft.) of Sefab (Sandvik) stainless steel tubes. X-ray, ultrasonics and microscopy have been extensively used for inspection throughout the manufacturing process, and before delivery the completed unit was submitted to a helium test to ensure that it was absolutely leak-proof. The pipes used are of Sandvik 3 R12 Atomic, cold-drawn in dimensions of 10.2 by 1 mm.

J. H. SANKEY & SON (HOLDINGS), LIMITED—Mr. S. P. Higgin, Mr. J. E. Currie, and Mr. R. G. Middleton have been appointed additional directors.

International Deep Drawing Research Group

FOLLOWING the highly successful colloquium on Forming and Testing of Sheet Metal held in Paris, it is planned to hold a further meeting in Düsseldorf on May 23 and 24, 1962, under the joint aegis of the International Deep Drawing Research Group and the Verein Deutscher Eisenhüttenleute.

The open sessions of the meeting will concern the Speed Effects in Sheet Metal Forming (effect of speed of deformation in deep drawing or other sheet forming processes; forming at very high speeds; explosive forming); and the Influence of Surface Conditions on Deep Drawing (effect of sheet metal surface, including metallic or non-metallic coatings; influence of tool surfaces; lubricants and lubrication).

Anyone wishing to contribute a paper for discussion at this meeting is required to forward the title of the proposed paper, a short summary, and the name of the author(s) to either of the addresses given below, before October 1, 1961. The number of papers which can be accommodated in the programme will necessarily be limited by the time available, and the final decision as to whether a paper can be accepted or not will rest with the organizing committee. All prospective authors will be advised by November 15, 1961, as to the acceptance or otherwise of their offers of papers.

The full text of all papers accepted must be available by January 15, 1962, so that copies can be circulated to delegates well in advance of the meeting, in order to facilitate discussion. Papers should be in either English, French, or German with a short summary where possible in all three languages. Offers of papers or requests for further information regarding this meeting should be addressed either to:—Mr. John Hooper, secretary, IDDRG, John Adam House, John Adam Street, Adelphi, London, W.C.2, or to Geschäftsfuhrung des Vereins Deutscher Eisenhüttenleute, Düsseldorf, Breite Str. 27.

New Home for Royce Electric Furnaces

TO cope with the special furnaces it manufactures, rehousing and re-equipping of Royce Electric Furnaces, Limited, has taken place in new premises at Sheerwater (Surrey).

A new feature in the electrical section is a furnace-testing panel enabling a comprehensive check to be made on heating uniformity, electrical circuits, controls, and insulation.

Orders Placed

Britain wins Order for Greek Blast-Furnace Linings

IN the face of strong competition from German and Japanese companies, Carblox, Limited, carbon brick manufacturing company of the Marshall Refractories group of Sheffield, has secured an order for a lining for a new blast furnace to be built near Athens. Carblox will also supply the firebrick linings and checker fillings for the two hot blast stoves which will be built for operation with the blast furnace.

The new plant—the first furnace in Greece—will be built by Acieries Halivourgiki, SA, Athens, which at the moment has only a steelworks. It will use iron ore from sources in Greece and thus save the importation of pig-iron. Mr. D. W. Hubbard, Carblox sales manager, announcing this £100,000 order on his recent return from Greece, stated that it represents a further substantial addition to the group's export business, which now extends to 36 different countries.

CONTRACT WORTH £19,000 for glandless circulating pumps has been received by J. & S. Pumps, Limited, from the U.K. Atomic Energy Authority, acting on behalf of the signatories of the OEEC high temperature reactor project (Dragon).

NINE REAR DUMP HAULERS, worth £20,000, have been shipped by Shawnee Poole, Limited, for the Dili Airport in Portuguese Timor. The Shawnee Poole System is currently being exported to some 13 European countries, as well as Africa, Australia, and the Middle East.

CONTRACT for eight Francis turbines for the Murray I power station in Australia has been awarded by the Snowy Mountains Authority to Boving & Company, Limited, water power engineers, of London, W.C.2. The station, it is claimed, will be the largest hydro-electric installation in the southern hemisphere.

ORDERS FOR high-speed diesel engines and accessories for industrial and automotive applications worth more than £160,000 were received last week by A.E.C. Limited. Among them was a £125,000 contract from Steels Engineering Products, Limited, Sunderland, for 80 engines and gearbox assemblies of various types, front axles and auxiliary gearboxes, for use in mobile crane carrier chassis.

NEW CHEMICAL plant engineering division of John Thompson, Limited, Wolverhampton, has received an order from the dyestuffs division of Imperial Chemical Industries, Limited, for engineering work on a £250,000 factory. The contract comprises extensions to an existing intermediate plant and includes vessels ranging from 50 gall. to 2,000 gall. capacity. The plant is due for starting up in 18 months.

CONTRACT worth £480,000 for a complete soda recovery unit for a pulp and paper mill in Yugoslavia has been won by Ernest Scott & Company, Limited, a subsidiary of Henry Balfour & Company, Limited, from Millspaugh Wimpey, Limited. A similar order for a £90,000 plant is for Ballarpur Paper Mills, India, and Ernest Scott is also to supply Mysore Paper Mills, India, with an evaporation plant worth £56,000.

INDIAN RAILWAY BOARD has awarded a £1,000,000 contract to British Insulated Callender's Cables, Limited, for the supply and installation of overhead equipment for 25 kV 50 cycles a.c. railway electrification over 250 track miles of suburban railway in the Calcutta area. The contract is the third of its type received by BICC from the same source since December, 1958, which together have been worth £4,700,000.

ORDER has been secured by Metal Industries (Europe), SA, a company in the Metal Industries, Limited, group, for the complete electrical equipment of eight harbour cranes for the Amsterdam Harbour Board. The contract, which is valued at nearly £50,000, calls for the supply of automatic control panels, motors, and installation.

Metachemical Machining Development

NEW company to develop the process of metachemical machining has been formed by B.S.A. Tools, Limited, and Metachemical Processes, Limited, Crawley (Sussex). Each company will hold 50 per cent. of the equity of the subsidiary, Metachemical Machines.

The process of metachemical machining is a means of shaping metal without using any cutting or burning tool. The part of the metal to be worked is immersed in a chemical solution which acts as an electrolyte. A shaping tool is brought close to the metal, but not in contact, and on the passage of an electric current the metal dissolves away to the exact dimensions required.

This process is claimed to be faster and cheaper than conventional methods and a special advantage is that the rate of removal of the metal is independent of its hardness. One application in the UK has been for the shaping of turbine blades for jet engines, where a very hard metal and a complicated design are involved. Another likely market is the production of forging dies, which by this process can be shaped after the steel has been fully hardened, rather than at a softer stage.

The technique was originated by Steel Improvement & Forge Company (SIFCO), of Cleveland, Ohio. Metachemical Processes is the UK associate of SIFCO and a series of agreements cover the mutual exchange of technical information and trading arrangements on foreign markets. Sales at home and abroad will be controlled by the existing B.S.A. Tools organization.

Chairman of the new company will be Mr. S. A. Roberts, managing director of the B.S.A. Tools group, and the managing director will be Mr. H. D. Hughes, who is also chairman and managing director of Metachemical Processes.

Rise in Delta Metal Profit Continues

PROFITS of the Delta Metal Company, Limited, manufacturers of brass, bronze, copper, forgings, stampings, etc., of London, S.E.10, have continued the rise experienced in the first quarter and the group figure for the first six months is "just over" £2,000,000, reports Mr. W. E. Ogden, the chairman. This excludes earnings of Davis & Timmins, Limited, manufacturers of automatic screw machine products, of London, E.17, the new subsidiary.

The chairman observes that since the forecast in June that the board hoped to maintain the ordinary dividend for 1961 at not less than 20 per cent., profits tax, Bank rate, and purchase tax have been raised. While these factors, he warns, are bound to affect trade somewhat, the group has received "encouraging" export orders for new lines, which it is hoped will go a long way to offset any temporary falling-off in home sales.

IRON AND STEEL TRADE

ALTHOUGH the drop of 3 per cent. in steel output last month, compared with July last year, may be attributed, at least in part, to factors other than a recession of any magnitude in the industry, steelmakers, generally, believe that fresh orders are unlikely to flow in any volume until October. The rate of destocking seems to have accelerated since the end of the second quarter, but it remains to be seen whether steel users will decide by the end of the third quarter whether they have reduced their reserves sufficiently to place specifications for more materials.

Pig-iron

A good many foundries have returned to work after the annual vacation, but holidays are still affecting the normal output of castings. Foundries are well supplied with pig-iron and deliveries of current requirements are executed at short notice.

The steelworks are also well supplied with their requirements of basic pig-iron. Buyers oversea continue to take up consignments in all grades, but more could be shipped if orders were forthcoming.

Ferro-alloys

Although most consumers have resumed business after the holiday period it is a little early to ascertain post-holiday demand. On business placed during the holidays for forward delivery, ferro-silicon and ferro-chrome are of moderate interest and there is a good demand for ferro-manganese.

There is a fair call on ferro-titanium, but interest in ferro-tungsten is virtually non-existent. Ferro-vanadium and ferro-molybdenum also remain quiet.

Semi-finished Steel

Production is on a reduced scale owing to the holidays. Demand for most of the products of the re-rollers is well below capacity level, particularly for small bars, light sections, bright drawn bars, and strip.

Carbon steel billets are more plentiful and while alloy steels are being offered more freely, in some instances these are for deferred delivery as producers are fairly heavily committed for these special grades.

Finished Steel

Several of the rolling mills are still on holiday and production is much reduced. Demand which has been very quiet for some time, still shows no signs of any improvement and additional tonnage can easily be absorbed in current and forward rollings.

Makers who specialize in the production of colliery requirements such as light rails, arches, pitprops, etc., are by no means fully engaged and additional tonnage for current or forward delivery could easily be absorbed.

New French Company to Produce Manganese

NEW company, Les Metaux Purs Pechiney-Outreau M.P.O., has been formed jointly by Pechiney, and Acieries de Paris et d'Outreau, on a fifty-fifty basis. The main object of the new company, with an initial capital of NF 5,000,000, is to produce and sell electrolytic manganese.

A plant with an initial capacity of 3,000 tons per annum is to be built in Boulogne-sur-Mer in Northern France.

"Rising Costs Nullify Increased Production"—John Shaw & Sons

WHILE looking forward to the future with reasonable confidence, Mr. A. W. Jeffs, chairman of John Shaw & Sons, Wolverhampton, Limited, tool manufacturers and merchants, says that if a halt cannot be made in the rise in costs, which seems to nullify each productive gain made, "we shall become less competitive in the markets of the world." Since the end of the financial year, incoming orders at the company's Wolverhampton and Sheffield factories are satisfactory. Mr. Jeffs states, and group sales for the first three months exceeded those of the corresponding period last year.

Through the installation of new and improved methods of mechanization, group sales increased by 11 per cent. in the year ended March 31, 1961. The increase was shared between the home and export markets. During the year £100,000 of plant and equipment was bought and although group commitments were only £31,000 at end-March, further substantial orders have since been placed, including a new plating plant for the Sheffield factory together with the doubling of the capacity of the Wolverhampton plating plant. The two items, with necessary equipment, will amount to £30,000.

Lancashire Foundry Trade

NEW business in iron and steel materials on the Lancashire markets during the past week has been at a low ebb, and in the opinion of many current trading conditions are as quiet as they have been at any previous period this year. As much as anything, in the case of foundry-pig-iron, at all events, this is due to seasonal holiday influences, now at about their peak. Those foundries that have been working during the week in the Lancashire and Cheshire areas have been mostly at capacity and a fair aggregate tonnage of low-phosphorus and other pig-irons has been going into consumption.

In the steel section an adverse factor in addition to seasonal influences is the continued cautious approach on the part of both stockholders and actual consumers to new buying operations. There is a fairly widespread feeling that by this time users' reserves in a good many instances have been greatly reduced and that before long they will be obliged to enter the market for bigger tonnages than they have been buying during the greater part of this year. More than ever the steel mills seem to be relying upon a traditional autumn revival for the rebuilding of their order-books, which are now mostly in a far from healthy condition.

Coalfield News

Welsh Miners' Leaders Saw Titov

LED by Mr. D. D. Evans, secretary of the South Wales Area of the National Union of Mineworkers, the party of 11 South Wales miners' leaders, who had been on a two-weeks 10,000 mile tour of Russia, returned to Moscow last week in time to join in the capital's welcome to Major Titov after his space flight.

During its tour, the party, which returned home last Friday, visited the Kuzbass coalfield in Siberia, which produces 83,000,000 tons of coal a year. Mr. Evans described the development of the coalfield in the last 18 years, with its highly mechanized pits, as "phenomenal."

RETURN TO WORK was made on Monday by 800 miners at Kingshill No. 3 Colliery, Allanton, Shotts (Lanarkshire), after a three-day strike last week.

MINERS who were employed at Northfield Colliery Shotts, when it closed last month have given a television set to the pneumoconiosis ward at Bangour Hospital, West Lothian.

AFTER SHOUTING a warning to workmates, Mr. David Hogg (59) was killed on Thursday of last week in a roof fall at Easthouses Colliery, Dalkeith. Teams of volunteer miners dug for nearly 12 hours to recover the body.

WHEN WORK WAS RESUMED at Benhar Colliery (Lanarkshire), after the "Fair" holidays, it was discovered that 72 hutchway rails, each 18 ft. in length and valued at £260, had been stolen from a locked compound.

AT PRESENT servicing No. 4 (Carlton) and No. 5 (South Barnsley) Areas of the North-Eastern Divisional Coal Board, the modern stores at Shafton (Yorks) is to be extended to include the No. 6 (North Barnsley) Area.

TOTAL OF THE fund for the dependants of the four men who lost their lives in the Cortonwood Colliery accident, has been raised to £159 13s. with a £10 grant from the general purposes committee of Goldthorpe Colliery, Rotherham.

A MEETING between officials of the East Midlands Divisional Coal Board and education leaders in Nottinghamshire is to be held at the Lound Hall training centre in September to consider the question of recruitment of young people for the mining industry.

AT THE INQUEST on Mr. Martin Henry Maund (35), who was killed while working underground at Nine Mile Point Colliery, Cwm (Mon), a verdict of Accidental Death was recorded. The coroner stated that he did not think there was negligence or carelessness on anyone's part.

A NEW COAL BUNKERING and bagging plant is to be built by the NCB at North Gawber Colliery, near Barnsley. It will provide a distribution service to merchants and industrialists and help to eliminate delays in coal deliveries. It is due to be in operation this autumn.

CASH PRIZE OF up to £50 is being offered by Sheffield University to any coal miner who can show a standard of literary achievement. The annual Arthur Markham memorial prize will be awarded for the best poem, or group of five poems, a short story, or the first chapter of a novel.

COAL AND COKE shipments through the port of Garston in July were: Northern Ireland, coal 45,735 tons, coke 259 tons; Eire, coal 8,110 tons; Isle of Man, coal 2,450 tons, coke 185 tons; Foreign coke, 5,391 tons, Foreign bunkers, coal 347 tons; other coastwise bunkers, coal 186 tons.

SHIPMENTS of coal and coke from the South Wales ports last week, influenced by the Bank Holiday, fell to the lowest weekly level this year. At 30,126 tons they showed a reduction of 26,606 tons from the preceding week, and of 13,582 tons compared with the corresponding week last year.

NEW PITHEAD baths at Florence Colliery, Longton (Staffs), which will be brought into use on Monday, will have accommodation for 2,256 men and ultimately will be equipped for 2,800. Manpower growth at the colliery has twice demanded extensions to the original baths built in 1930.

INQUEST ON a former North Shields miner, Mr. Joseph Cumming (72) has been adjourned for a full official report by the National Coal Board on an accident at Cambois Colliery. Mr. Cumming was seriously injured in the accident which took place at Cambois Colliery in March, 1942.

OVERALL PRODUCTIVITY in the Durham Division of the NCB last week averaged 22.86 cwt. per manshift, compared with 19.76 cwt. in the same week last year. At the face, productivity was 65.87 (60.76) cwt. Overall productivity in the first 31 weeks of the year averaged 23.13 (22.03) cwt. per manshift, with 65.95 (64.58) cwt. at the face.

WITH THE INTRODUCTION of a rapid plough on a mechanized face, in the South Staffordshire thick coal seam at Baggeridge Colliery, Sedgley (Worcs), productivity records five and a half years old were broken last month. The plough is one of several which have been introduced in the West Midlands Division of the National Coal Board.

SEVENTH ANNUAL TOUR of its kind organized by the Nottinghamshire District Welfare Committee of the Coal Industry Social Welfare Organization, in association with the Nottingham area of the National Union of Mineworkers, a party of 23 miners left Nottingham on Wednesday of last week for a 19-day camping holiday in France, Italy, and Switzerland.

AT ITS MEETING on Thursday of last week, the Houghton Main Colliery (Yorks), branch of the National Union of Mineworkers, decided to reopen the case of Mr. Arthur Moss, the former miner, whose claim for £200 compulsory retirement gratuity was recently refused, on the grounds of inelegibility, by Lord Robens, chairman of the National Coal Board, after a personal review of the case.

THREE CANDIDATES have accepted nomination for the presidency of the Scottish Area of the National Union of Mineworkers in succession to Mr. Abe Moffat, who retires on September 24. They are Mr. Alex Moffat, vice-president of the Area and brother of the retiring president, and two members of Fife County Council, Mr. Alexander Eadie and Mr. Andrew Hamilton. Election by ballot took place on Tuesday and Wednesday and the result will probably be announced tomorrow (Saturday).

MINERS AT Wharncliffe Woodmoor Nos. 4 and 5 Colliery, near Barnsley (Yorks), have sent a petition to the Traffic Commissioners at Leeds asking that the private bus service which saves them a four-mile walk each day, be allowed to continue. The Commissioners had told the bus proprietor that he could not operate the three-times-a-day service without a conductor. In an attempt to beat the ban the bus has been modified. "If the bus does not run this winter, it could result in some men leaving the industry," warned Mr. Fred Hanson, local official of the National Union of Mineworkers.

THE COAL TRADE

COLLIERY holidays have brought production to a standstill in many districts. Holidays are also the main cause of quiet trading conditions. Nevertheless, a surprising number of consumers, on both industrial and domestic fronts, are showing interest in getting stocks in, and, in some areas, cooler weather has produced a fair number of orders for immediate delivery. This has emphasized a scarcity of best grades, and called for substitutions from collieries not on holiday. Merchants are showing anxiety to lay down good stocks of anthracite and premium smokeless fuels for the winter, but the present level of production falls far short of their needs.

SCOTLAND

Glasgow.—Supplies generally are plentiful, but if the curent level of production is to be the standard in a few months' time there is a definite likelihood of stringency in the event of cold weather. The domestic sector is most in need of attention. The total stock at depots last month amounted to 165,000 tons, which was 45,000 tons, or some 15 per cent., less than last year. When it is recalled that weekly consumption during January exceeded 100,000 tons a week, the low margin of reserves is at once apparent.

In contrast, substantial progress has been made by the electricity works to ensure adequate stocks, which at 576,000 tons, compared with 456,000 tons last year. This is approaching the equivalent of six weeks' winter peak consumption, and consolidation should be completed by the end of October. Gasworks had rather more to make up to achieve the same standard, but with 150,000 tons laid down this was cover for nearly four weeks' winter demand. The railways' stock, at 86,000 tons, was well above the average of former years.

Although down on the year at 87,000 tons against 100,000 tons, coking coal reserves were little changed, having regard to the fact that all the prospects at present are that throughputs at the coke ovens will be reduced at the end of the year. Other grades used by the iron and steel industry appeared reasonably satisfactory at 37,000 (42,000) tons in view of the easier demand for steel. Engineering firms had a total of 22,000 tons against 25,000 tons in 1960, but the cover was equal to more than four weeks' winter needs. Other industry, with over four weeks in hand (170,000 tons), showed a slight improvement on the year.

DERBYSHIRE

The gradual return from annual holidays is reflected in a steady improvement in the number of orders reaching merchants' order offices and, with some staffs still on holidays, there is little difficulty in keeping all vehicles fully occupied. Orders for best and hand-picked coals are coming to hand in a reasonable manner, with despatches against contract commitments satisfactorily maintained. There is a fair request for the better types of screened cobbles and brights, and forwardings are up to requirements. Cheaper brights continue to receive a fair amount of attention, and supplies additional to normal tonnages are becoming increasingly difficult to obtain. Best large nuts are not in great demand, and current arrivals have to be regulated in keeping with the order position. Washed medium and small nuts experience a steady demand and forwardings are on a satisfactory scale, although doubles are not easy to obtain outside normal contracts.

Interest in domestic coke nuts is reviving slowly, but prompt delivery of all orders can be given from adequate stocks. Premium smokeless fuels are in moderate request, and additional tonnages of Coalite and Rexco are still difficult to procure. Anthracite supplies remain tight, and consumer interest is becoming greater; at present most inquiries can be met from merchants' stocks, but replacement of these is giving rise to mild concern. Phurnacite orders continue to be several weeks in arrear, which is also causing some apprehension.

Demand from industrial users is still governed by holidays, and little difficulty is experienced in meeting current inquiries. Substitutions are sometimes made necessary owing to colliery holidays, but no serious problems occur. The market for all grades of hard and gas coke is fairly quiet.

Coal Stocks Position

DETAILS of coal stocks as at August 5, 1961, compared with those available at August 6, 1960, are given in the appended table issued by the Ministry of Power.

Figures in parentheses, mainly calculated on the basis of requirements during the winter, indicate the total weeks which the tonnage in stock would last.

	August 5, 1961.	August 6, 1960.
	Thous. tons.	Thous. tons.
Distributed stocks		
Public-utility undertakings—		
Electricity	7,447 (5.6)	5,946 (5.1)
Gas	2,118 (4.1)	2,037 (3.8)
Coke ovens	1,350 (2.5)	1,299 (2.6)
Railways	649 (3.5)	492 (2.3)
Industrial consumers—		
Iron and steel	189 (2.1)	192 (2.2)
Engineering and other metal industries	272 (3.1)	282 (3.2)
Other industries	1,967 (3.8)	1,707 (3.3)
TOTAL INDUSTRIES	2,428	2,181
Merchants' stocks—		
(*a*) House coal	1,442 (1.9)	1,154 (1.5)
(*b*) Anthracite and boiler fuel	229 (3.8)	185 (3.1)
Miscellaneous (estimated)	250	313
TOTAL DISTRIBUTED STOCKS	15,913	13,607
Undistributed stocks—		
At collieries (on ground and in wagons)	18,192	27,939
At open-cast sites	4,440	6,523
TOTAL UNDISTRIBUTED STOCKS	22,632	34,462

Board Changes

SAMUEL OSBORN & COMPANY, LIMITED—Mr. Cecil F. Hurst, deputy chairman, has been appointed assistant managing director.

JAMES BROWN & SONS, LIMITED—Managing director, Mr. J. C. H. Boota, has been elected a director of Summerson Holdings, Limited, Darlington, and its main engineering subsidiaries.

MARRYAT & SCOTT HOLDINGS, LIMITED—Mr. R. Walker has been elected a director and has relinquished the office of secretary. Mr. A. J. Bryant has been appointed secretary in his place.

BACKER ELECTRIC COMPANY, LIMITED—Mr. S. G. Nimrod, deputy managing director, has been appointed chairman and managing director of the firm in succession to the late Mr. C. M. Kramer.

WILLIAM BLYTHE & COMPANY, LIMITED—Mr. H. Warne has resigned as managing director and from the board of the company, and has also resigned from the boards of the company's subsidiaries.

PHILIPS ELECTRICAL, LIMITED—Mr. J. P. Engels has been appointed managing director in succession to Mr. G. F. Hofman, who has reached retiring age after 40 years' service with the company.

BARROW HAEMATITE STEEL COMPANY, LIMITED—Sir Harold Gillett, Sir Leslie Nicholls, and Sir Leslie H. Williams have resigned from the board of the company which is now a subsidiary of Arusha Industries, Limited.

GUEST KEEN & NETTLEFOLDS, LIMITED—Sir Douglas Bruce Gardner, a director of the company, and of the G.K.N. Steel Company, Limited, has been appointed to the board of the subsidiary, Guest Keen & Nettlefold (South Wales), Limited.

MOSS GEAR COMPANY, LIMITED—Mr. E. Cars, formerly works director, has been appointed joint managing director in place of Mr. J. R. Hudson who has retired after 43 years with the company. Mr. J. T. Riley has been appointed works director.

INDUSTRIAL EDUCATION INTERNATIONAL, LIMITED—Mr. John Blinch has joined the board and also the board of the associated company Materials Management International, Limited. He will be responsible for the work of these two organizations in Europe.

MONSANTO CHEMICALS, LIMITED—Mr. John C. Garrels, jnr., deputy managing director, is to become managing director in succession to Mr. D. R. Mackie, who is resigning from the position for health reasons from October 1. Mr. Mackie will remain on the board.

SCAFFOLDING (GREAT BRITAIN), LIMITED—Mr. J. A. Bowker and Mr. C. H. Vaughan have been appointed directors. Mr. Bowker was formerly general manager of the building equipment division, and Mr. Vaughan formerly manager of the scaffolding contracts division, of Scaffolding Great Britain (Holdings), Limited.

CONSOLIDATED ZINC CORPORATION, LIMITED—Mr. M. A. Mawby has been appointed chairman of Consolidated Zinc Pty., which is the overall management company for the Australian interests of the group. Mr. M. I. Freeman has been appointed chairman of Imperial Smelting Corporation, Limited, which conducts the smelting and chemical operations of the group in the UK.

BIRMID INDUSTRIES, LIMITED—Mr. W. J. Sully has been appointed technical director, light alloy foundries, and a director of the subsidiaries: Birmingham Aluminium Casting (1903) Company, Limited, Perry Barr Metal Company, Limited, and Birmidal Developments, Limited. He had relinquished his appointment as joint managing director of Sterling Metals, Limited, but remains a director. Mr. E. Player, junior, a director of Sterling Metals has been appointed general manager.

Holidays Halve Coal Output

WHILE coal output in Bank Holiday week was almost exactly halved—1,934,000 tons won, and 1,750,000 tons attributed to holidays and disputes—it was up on last year's comparable week. Similarly productivity dropped to below the average for the year so far, but it was well above the figure for 1960.

Undistributed stocks continue to be drawn on and are now down to 22,632,000 tons, nearly 12,000,000 tons less than a year ago. Consumers' stocks, on the other hand, continue to build up and are almost 16,000,000 tons, compared with 13,600,000 tons last year.

There were 564,900 wage-earners on colliery books on August 5, against 593,340 on August 6, 1960, the numbers engaged at the coal face being 212,060 and 226,450 respectively. Total absenteeism (all workers) in the week ended August 5 was 16.79 per cent., compared with 16.59 per cent. in the week ended August 6, 1960. Output at the face was 4.076 tons and overall 1.355 tons in the week ended August 5, compared with 3.619 and 1.189 tons in the week ended August 6, 1960. The following table gives (in tons) the provisional figures of output of saleable mined coal by division in the week ended August 12, and the tonnage lost through disputes:—

Division.	Week ended August 12, 1961.		Week ended August 6, 1960.*
	Total output.	Tonnage lost.	Total output.
Scottish	312,000	29,000	287,000
Northern (N&C)	102,000	120,000	130,000
Durham	251,000	191,000	256,000
North-Eastern	427,000	375,000	384,000
North-Western	142,000	92,000	157,000
East Midlands	442,000	401,000	417,000
West Midlands	—	278,000	—
South-Western	115,000	235,000	122,000
South-Eastern	—	28,000	—
Great Britain—			
Deep-mined coal	1,791,000	1,749,000	1,753,000
Open-cast coal	119,000	—	105,000
Other deep-mined (including licensed mines)	24,000	—	25,000
TOTAL	1,934,000	1,749,000	1,883,000

* Comparable week last year.

Increases of Capital

TITALLIUM, LIMITED, scrap metal merchants, etc., London, E.C.2, increased by £13,000, in £1 ordinary shares, beyond the registered capital of £2,000.

THEODORE EVANS, LIMITED, ironfounders, etc., of Dudley (Worcs), increased by £65,000, in £1 ordinary shares, beyond the registered capital of £10,000.

C.K.S. GROUP, LIMITED, black and tin plate workers, etc., of London, W.1, increased by £20,000, in £1 shares, beyond the registered capital of £75,000.

BROMFORD IRON & STEEL COMPANY, LIMITED, West Bromwich, increased by £100,000, in £1 ordinary shares, beyond the registered capital of £20,000.

FOLLSAIN, LIMITED, smelters, ironmasters, etc., of Rugby, increased by £75,000, in 4s. ordinary shares, beyond the registered capital of £280,000.

ARTHUR HUDSON FORGE & ENGINEERING COMPANY, LIMITED, Brighouse, increased by £6,000, in £1 ordinary shares, beyond the registered capital of £4,000.

WILLIAM DOUGLAS & SONS (ENGINEERING), LIMITED, London, S.W.15, increased by £100,000, in £1 ordinary shares, beyond the registered capital of £100,000.

JOHN AKWORTHIE, LIMITED, machine-tool makers, etc., of Kenilworth, increased by £25,000, in £1 ordinary shares, beyond the registered capital of £25,000.

Company News

INDIAN IRON & STEEL

Chairman's Warning on Future Production

ALTHOUGH a higher level of production was achieved by the Indian Iron & Steel Company, Limited, in 1960/61 than in the previous year, deterioration in the quality and supply of coking coal and limestone may make it impossible to achieve the output envisaged at the time the plant extensions were planned, warns Sir Biren Mookerjee, chairman, in his annual statement. "In fact," he states, "grave difficulties are foreseen in maintaining future production even at the 1960/61 level."

The chairman says that blast-furnace operations throughout the year to March 31, 1961, were carried out under difficult conditions due to the extremely high and varying ash content of the coke caused by the poor quality and erratic supplies of metallurgical coke, and also because of the deterioration in the quality of limestone supplies. The quantity and quality of iron produced was affected, which in turn imposed difficult production conditions on the steel melting shop.

The improvement in tonnage, despite these conditions, would have been greater, says the chairman, but for the loss of output resulting from the strike of railway employees in July, 1960. Output at the Kulti foundries again showed improvement due mainly to increased production by the spun pipe plants. These increases were reflected in improved trading results.

Steel Output

Production of steel ingots and castings by the company in 1960/61 was 914,159 metric tons, compared with 840,305 tons in the previous year. Output figures for saleable steel, with the figure for the previous year in parentheses, were:—Bars, 132,738 (56,764) tons; structurals, 153,165 (158,889) tons; black sheets, 79,701 (76,827) tons; galvanized sheets, 69,364 (64,688) tons; blooms, slabs and billets, 219,231 (244,208) tons. Production of pig-iron was 1,160,576 (1,070,470) tons; coke, 1,359,779 (1,364,558) tons; and iron castings, 217,294 (178,695) tons.

Referring to the company's expansion programmes, the chairman says that all major items of plant under the 1953 and 1955 programmes were completed with the commissioning on June 10, 1960, of the new bar and rod mill. Efforts are now being concentrated on the provision of subsidiary services designed to improve the efficiency of the expanded plant. Work has started on the modernization of the 34-in. mill stands, and completion of this work is envisaged by November, 1961.

IMPERIAL CHEMICAL INDUSTRIES, LIMITED—The offer to members of Settle Limes, Limited, quarry owners and lime burners, of Settle (Yorks), has been accepted in respect of 90 per cent. of the shares concerned and is now unconditional.

HALKYN DISTRICT UNITED MINES, LIMITED—Reduction of the company's capital in accordance with the special resolution passed on March 28, 1961, has been approved by the court, and repayment of 1s. per 2s. unit of ordinary stock will be made on or after August 25.

FODENS, LIMITED, makers of dump trucks, oil engines, etc., of Sandbach (Ches)—Mr. Albert Stubbs, the chairman, states that home trade is brisk and the company's order-book is the longest on record. "We feel ourselves almost fully extended to keep deliveries within reason," he says. Net profit was a record, as was turnover.

COPE, ALLMAN & COMPANY, LIMITED, brass, copper and cased tubes manufacturers, of Birmingham—Arrangements have been made to acquire the whole of the ordinary and preference share capital of Gilby Engineering Company, Limited, production engineers, of London, E.18, by the issue of 60,000 (restricted voting) "A" ordinary 5s. shares.

MOUNTSTUART DRY DOCKS, LIMITED—Hopes that the improvement experienced in the year to March 31, 1961, will be maintained or even bettered are expressed by the chairman, Sir G. Leighton Seager. Group profit, before tax, increased to £93,654 (£72,548) and, had it not been for a very considerable loss at Barry, the results would have been very much better. The dividend is increased to 6 (5) per cent.

CANNON (HOLDINGS), LIMITED, ironfounders and manufacturers of domestic gas appliances and chemical plant, of Bilston (Staffs)—Interim dividend in respect of the year ending September 30, 1961, is 5 per cent. For the previous 15 months there was no dividend, but holders received a distribution of 11 per cent., not subject to tax, from the surplus on the sale of investments. Previous ordinary dividend was 20 per cent. for the year ended June 30, 1959.

MOLER PRODUCTS, LIMITED, heat insulating products manufacturers, of Colchester (Essex)—Group profits for the year ended June 30, 1961, expanded from £100,166 to £120,117 and, after tax of £55,358 (£49,859), the net profit of £64,759 compares with £50,307. The company is repeating its dividend at 16⅔ per cent., with a 10 per cent. final. A one-for-three scrip issue is also proposed. Mr. R. W. Young, chairman, states that the volume of orders received and goods despatched during the year reached record levels, and the company entered the new year with a buoyant order book.

BALFOUR & DARWINS, LIMITED—The offers for the issued capital of Arthur Balfour & Company, Limited, and of Darwins Group, Limited, by Balfour & Darwins, the holding company formed to effect the merger, have been declared unconditional, subject to permis-

sion to deal on the London Stock Exchange and quotation for the capital of the new company being granted. The expiry dates have been extended to September 7. Acceptances have been received for 95 per cent. of the capital of Arthur Balfour and 84.1 per cent. and 90.6 per cent. respectively of the preference and ordinary capital of Darwins.

WICKMAN, LIMITED, machine tool and small tool specialists, of Coventry (Warwickshire)—Lord Aberconway, chairman, tells shareholders in his statement with the 1960 to 1961 accounts, that the company entered the current year with an order-book greater than ever. The past year was marked by exceptional activity in all sections of the business, but instances occurred of occasional disputes with the company's workpeople, and these, coupled with late deliveries of certain materials, have delayed some machine deliveries to customers. Consolidated profit, before tax, for the year to March 31, 1961, was £1,542,152 (£1,073,771).

RTB to Close Steelworks at Pontardawe

LAST major industry in the town, the Pontardawe (Glam), steelworks of Richard Thomas & Baldwins, Limited, is to close down. The works, which employs 388 men, had become an "embarrassment" to the company, said Mr. Henry F. Spencer, chairman of RTB, in a recent letter to the Pontardawe Industrial Development Committee. It could not produce the quality of sheet steel demanded by customers, who were now able "to pick and choose their suppliers."

The demand for steel sheets, continued Mr. Spencer, had lessened at the same time that capacity had increased at the Port Talbot works of the Steel Company of Wales, Limited, and the Shotton (Ches) works of John Summers & Sons, Limited. He pointed out that the standard of quality required does not permit of anything but the highest quality steel in the strip mill and, unfortunately, Pontardawe, which supplied ingots to the Ebbw Vale works, cannot maintain the quality required.

Quantity also was embarrassing, Mr. Spencer went on. "We have large stocks of slabs and ingots at Ebbw Vale of such quality that they are usable under present stringent quality conditions only in small quantities, over a very long period of time." He added that redundancy payments will be made and such a scheme will be fully discussed with the unions concerned.

GEORGE KENT CONTRIBUTION TO EXPORTS

OVERSEA orders of subsidiaries and branch offices of the George Kent, Limited, group of industrial instrument makers, etc., of London, W.C.1, accounted for nearly 20 per cent. of total orders received at the Luton works. The percentage does not take into account other export orders obtained through agents in countries not covered by subsidiaries or branch offices.

Orders for the first four months of the current year showed a marked improvement over the corresponding period in the year to April 1, 1961, states the chairman, Cmndr. P. W. Kent. Group net profits rose to £323,319 (£307,061).

Personal

Works manager of Cowans, Sheldon & Company, Limited, engineers, ironfounders, and crane builders, of Carlisle, Mr. HORACE SCHOFIELD has retired after 32 years' service with the firm.

Mr. J. P. R. SMITH, a director of Wm. H. Capper & Company, Limited, engineers and tube manufacturers, of Warrington, has been elected a Fellow of the Chartered Institute of Secretaries.

Managing director of the Peterborough diesel engine firm of F. Perkins, Limited, Mr. M. I. Prichard is back in Peterborough after a three weeks' trip to Brazil and the Argentine during which he had an interview with the Argentine president, Dr. Arturo Frondizi.

Mr. R. W. CUTLER, who began his career with the company as an apprentice, has retired from the position of chairman of the board of the Speedwell Gear Case Company, Limited, Witton, Birmingham. He will maintain his association with the firm in a consultative capacity.

Owner of the Hendy Merthyr, Craigcefnparc (Glam), and the Felinfran, Glais (Glam) collieries, before they were nationalized in 1947, Mr. RICHARD THOMAS has retired from the active list of magistrates for Glamorgan after 41 years' service as a JP. He has been chairman of the Pontardawe Petty Sessional Division for the past 11 years.

Chairman of the National Coal Board, LORD ROBENS will speak at the national conference of the Institute of Personnel Management to be held in Edinburgh from October 5 to 7. Theme of the conference, at which about 800 delegates are expected to attend, will be "Creative and Industrial Enterprise." At the inaugural dinner the guest of honour will be Lord Cameron.

AFTER 26 years' service with the General Electric Company, Limited, Mr. J. P. CLIFTON, manager of the technical manuals department at the Witton Works of the company has retired. He will continue to serve in a consultative capacity until the end of September. Mr. Clifton who joined Metropolitan-Vickers Electrical Company, Limited, as a graduate apprentice in 1913 went to GEC in 1935 as deputy manager of the contract department. He was promoted manager in 1955 and to his present position in 1958.

The Queen has appointed Mr. S. S. ERIKS, managing director of Mullard, Limited, an honorary Knight Commander of the Order of the British Empire in recognition of his valuable services to British official interests. Mr. Eriks who was born in Holland, joined NV, Philips, Eindhoven in 1924 and after several oversea posts, became general manager and later a director of the Mullard company. After the war he became managing director of Mullard, Limited, and also chairman of Philips Electrical Industries, Limited, which administers the Dutch company's interest in the UK.

Fall in World Steel Output in First Half of 1961

WORLD steel production in the first half of 1961, at 182,394,000 net ingot tons, was a 4 per cent. decline on the 189,485,000 net tons produced in the first half of 1960, the US Business and Defence Administration has reported. Output by the United States was 16,000,000 tons lower, but the agency predicted that total 1961 world steel production would exceed the 360,250,000 net tons turned out in the whole of 1960.

World steel output last year—exclusive of the US—was 7 per cent. up on the previous year, it was stated.

Mining Qualification's Board Examinations

IN the examination for certificates of competency, held by the Mining Qualifications Board in May/July, 155 candidates were successful in securing first-class certificates. There were 86 successful for the undermanager's certificate and 92 qualified as surveyors of mines. At the May examination there were 11 successful candidates for electrical engineers, 15 for electricians Class I, 12 for mechanical engineers and nine for mechanics Class I.

Lists of successful candidates at the various examination centres are printed below.

First Class Certificates (Mine Managers)

GLASGOW.—J. W. Bathgate; A. K. Bhattacharyya; J. Bonnar; J. S. Brown; K. C. Deo; D. Mc. Frew; A. M. Gibbs; M. M. Grierson; J. F. G. Hall; J. L. Hepburn; T. Higginson; R. Maxwell; J. McFarlane; J. R. McLellan; A. McMillan; J. K. F. McTear; J. Mitchell; A. K. Mukherjee; J. Parker; W. A. Pollock; J. Quinn; H. Reston; D. P. Roger; W. K. Smith; W. T. Steel; J. B. Stewart; J. M. Thomson; J. Welsh.

SUNDERLAND.—M. K. Anderson; J. Barrass; J. Brownless; R. W. Carr; R. T. Davies; J. Eilbeck; R. Foster; R. W. Graham; G. R. Henderson; G. Johnson. W. M. Lamb; W. B. Lyon; J. Lyons; D. R. Parry; J. W. Price; W. Ranson; N. Robson; G. W. Sanders; G. Smailes; F. Sunley; B. Whittaker; C. B. Williams.

DONCASTER.—G. Appleyard; N. R. Atkinson; R. Barradell; J. M. Bennett; G. Bloom; T. P. Booth; E. Brown; D. Bucklow; A. F. Bummiss; D. N. Chouthary; A. Cuthbert; E. Furniss; S. R. Ghosh; T. Griggs; J. Haggis; K. Haigh; A. Hartley; H. G. Hilditch; D. Hill; K. A. Housley; G. Hutchinson; K. Jones; J. K. Kochhar; S. M. Mitra; R. B. Mokadam; D. Moore; B. Mumdy.

T. J. Nash; C. R. Noble; B. L. Orange; D. Palmer; B. F. Pinder; M. F. Pleming; M. A. H. Price; G. Prince; P. J. Rafter; D. Rhodes; J. Robinson; J. Screen; V. Shastry; R. W. Smith; D. Stephenson; B. R. Timms; D. Tuke; B. H. Waite; A. S. Walker; R. Wiles; J. Winpenny.

WIGAN.—R. G. Andrew; T. R. Crehan; D. Earnshaw; G. E. Gregson; D. Hobson; D. C. Lloyd; F. P. Reid; W. Sargent; R. Sidlow; R. S. Singh; G. R. Sutton; T. Tomlinson; J. Williams.

CARDIFF.—K. Beynon; R. W. L. Davies; M. L. Dugar; G. C. Garrett; J. T. Grace; B. I. Havard; G. G. Jenkins; D. John; C. Jones; I. M. Jones; W. J. Llewellyn; N. G. Long; G. Morgan; J. T. O'Brien.

J. T. W. Phillips; V. L. Rogers; I. Shankland; R. A. Smarzly; K. C. D. Stobart; B. C. Thomas; D. Thomas; D. R. Thomas; W. J. Williams.

STOKE-ON-TRENT.—K. K. Batra; R. F. Boyes; H. R. Bradbury; M. D. Bradford; C. M. Brooker; I. J. Brown; W. O. Cashmore; M. J. Causer; A. R. Coates; J. Cockburn; N. Harvey; D. J. Humphries; A. N. Muhuri; R. Mullins; G. M. Omezi; P. Savage; A. Tong; D. Turner; B. Weston; G. W. White; W. J. Worker.

LIMITED STRATIFIED IRONSTONE.—E. Farmery.

Second Class Certificates (Undermanagers)

GLASGOW.—J. S. Clark; W. G. Cook; J. Findlay; R. B. Fraser; D. McF. Gaw; H. M. Mackie; W. G. Nicol; D. A. Pearson; J. Stewart; P. W. A. Taylor; G. W. Veitch.

SUNDERLAND.—R. Ashurst; T. Blair; R. Bone; C. Brakewell; N. Cooke; J. T. Corner; A. H. Cowie; C. F. Davis; W. Dodsworth; M. Emery; R. M. Hurst; R. Lock; T. Lowther; G. B. Robson; J. Sanderson; N. Sharan; F. L. Stephenson; H. H. Teetsov; P. F. Venus; R. Wheatley; I. J. Wilkinson.

DONCASTER—T. Barraclough; H. Bartley; R. Berry; A. Burkinshaw; J. H. H. Chamberlin; D. Clay; A. E. Day; H. Douce; F. A. Fletcher; B. E. Hadfield; D. M. Hardy; D. Heathcote; G. A. Holland; C. Hoyle; H. Inger; B. J. Jones; W. J. Kidd; B. Mangles; A. E. Marshall; S. A. Mather; A. E. Morris; A. V. Murcott.

I. Nicholson; M. Novakovich; J. A. S. Oldcorn; F. R. S. Pare; T. P. Schofield; J. E. Simpson; R. H. Simpson; K. M. Sokolow; F. Straw; W. A. Swift; W. Sykes; K. K. Talwar; J. F. Taylor; G. Thompson; J. J. Timms; J. D. Tomlinson; R. Young.

WIGAN.—W. K. Dignon; M. E. Lally; R. T. Pye; D. J. Sarsfield.

CARDIFF.—T. J. Bevan; W. A. Jones; C. R. Lewis; P. J. Stacey.

STOKE-ON-TRENT.—M. W. Brabbins; W. D. Bullock; K. Harp; B. Hill; E. Matthews; A. V. Plant; J. Sutton.

Surveyors of Mines

GLASGOW.—H. Anderson; J. N. Archibald; J. McI. Barr; D. Ewart; A. T. Gibson; W. W. Hendry; R. S. Johnston; W. T. G. Johnstone; J. H. Laing; S. J. McLeod; A. R. Milligan; J. McG. Mitchell; N. E. Woods.

SUNDERLAND.—W. J. Bothwell; O. Brennan; A. H. C. Churchill; K. Donkin; G. Heron; A. Lindsey; W. Murthar; B. Richardson; D. Robinson; J. C. Walker; A. H. Wallace; A. Whitfield; W. Wood.

DONCASTER.—J. A. Archer; D. J. Betts; R. A. H. Bond; K. P. Bullock; G. A. Darlow; K. Dennison; M. D. Dickman; M. K. Donlon; J. D. Fenton; M. Fryer; K. Harrison; J. B. Hill; F. Jones; J. D. Knowles; P. A. Knutton; R. A. Leggett; P. E. Leggitt; J. Lester; A. R. Lockwood.

M. McMullan; P. J. Moore; D. A. Morrison; J. Naylor; P. Oliver; A. Peberdy; B. J. Place; K. P. Shipman; M. D. Skinner; T. Speed; B. T. Stringfellow; C. W. Townsley; G. White; A. Whitehouse.

WIGAN.—J. S. Benson; N. Cannon; R. D. Dalton; C. Dewsnap; T. J. Hilton; D. G. Hulmes; P. Mulroy; J. T. Phillips; R. Walsh; S. Wood.

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Electrical Engineers

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SUNDERLAND.—R. P. Mears.

DONCASTER.—P. Carr; R. Lancaster; R. E. Peebles.

WIGAN.—B. Farrar; I. W. Greenwood.

CARDIFF.—T. G. Morgan; W. D. Price; C. Seymour.

STOKE-ON-TRENT.—C. D. Noble.

Electricians Class I

GLASGOW.—M. Connelly; G. W. Hutchinson.

SUNDERLAND.—J. Coates.

DONCASTER.—J. C. A. T. Brown; C. G. Else; W. Hewitt; S. James; M. Martin; C. A. McTighe; A. Robson; E. Tyas; F. A. Whiteley.

CARDIFF.—J. E. Harris.

STOKE-ON-TRENT.—A. J. Matthews; M. H. Smith.

Mechanical Engineers

GLASGOW.—J. Corns; J. D. Grieve; A. G. Hay; D. W. Storrar.

SUNDERLAND.—W. Strong.

DONCASTER.—D. R. Morley; H. V. Schofield; D. Surman.

CARDIFF.—D. G. Ball.

STOKE-ON-TRENT.—A. J. Allen; P. J. Barker; D. J. Williams.

Mechanics Class I

GLASGOW.—A. W. Peters; J. Watson.

SUNDERLAND.—A. W. Robson.

DONCASTER.—D. Cooper; R. A. Green; C. Riding; E. Turton.

STOKE-ON-TRENT.—E. Ridgway; D. A. Thompson.

British Aluminium Expansion Project in Canada

CONSTRUCTION work on the third stage of its development plan for the Baie Comeau plant in Canada, which is estimated to cost about £12,500,000 will begin in 1963, Lord Plowden, chairman of British Aluminium Company, Limited, said last week. The group's subsidiary, Canadian British Aluminium Company, Limited, will expand its smelter there by another stage to produce an additional 45,000 short tons of aluminium a year. The additional facilities are expected to come into operation by 1965.

The plant has at present an annual capacity of 90,000 short tons; the first stage came into operation in December, 1957, and the second stage in the spring of 1959. It was originally planned that the smelter project would be developed in four stages, each with a designed annual capacity of 40,000 long tons of aluminium ingots. Stages 3 and 4 were scheduled for 1961-65.

British Aluminium is now jointly controlled by Tube Investments, Limited, and Reynolds Metals, of the US.

Area Output Record in Yorkshire Coalfield

CONGRATULATING staff and workmen of the No. 5 (South Barnsley) Area of the North-Eastern Divisional Coal Board on reaching an overall output per manshift of over 40 cwt.—the first Area in Yorkshire to do so—in early July, Mr. W. H. Sales, divisional chairman, said the Area had not only set standards in mining efficiency for the rest of Yorkshire to follow, but had also shown that management and men could discuss, debate, and argue without impairing their ultimate objective.

MR. W. H. SALES

Mr. Sales, who was speaking at a recent dinner in Barnsley Main Colliery Training Centre in celebration of the event, said that the Coal Board sought to do two things: to produce coal cheaply and efficiently, and to raise in consequence the living standards of the mineworkers and their families. Area No. 5 had succeeded in doing both, but he would be even happier if the same achievement could be celebrated throughout the whole of the Yorkshire coalfield.

Area general manager, Mr. J. E. Longden, said the record could not be attributed to favourable mining conditions; the average seam thickness worked in the Area was under 3 ft., and many of the pits were over 100 years old. It was the result of resolve by the management and workmen to face the natural difficulties and hazards of coalmining with determination and overcome them with energy. The Area had always been to the fore of developments in mechanization and he was confident it would remain there. He had no intention of sitting contentedly on 40 cwt. a manshift; 50 cwt. must be the next target, and after that 60 cwt.

Yorkshire miners' president, Mr. Sam Bullough, added his congratulations to those of Mr. Sales. The NUM was pledged, he said, to support increased mechanization, and he was delighted to see that in Area 5 it had paid off in all senses of the word.

New Coal-fired Power Station Project for Scotland

APPLICATION has been made by the South of Scotland Electricity Board to the Secretary of State for Scotland for consent to build a coal-fired generating station to the west of the East Lothian village of Cokenzie. If the application is approved, the board hopes to begin work on the site early next year, and the project will provide work for 12,500 miners in the expanding Lothians coalfield.

The station will be half as large again as the Kincardine-on-Forth station opened last year, and will have a generating capacity of 1,200,000 kW. About 10,000 tons of coal a day will be required, and two new shafts, Monktonhall and Bilston Glen, are conveniently placed to supply coal to the site.

European Coal Output

THE appended figures relating to coal output and imports are taken from statistics issued from Geneva by the Coal Committee of the Economic Commission for Europe.

Tonnages are metric, and the number of underground workers employed relates approximately to the end of the month.

TABLE 1.—*European Coal Output (Metric Tons) and Employment.*

Country.	Output.		Underground employment.	
	May, 1961.	April, 1961.	May, 1961.	April, 1961.
Belgium	1,922,000	1,864,000	72,000	73,000
France	4,395,000	4,229,000	121,000	122,000
Italy	65,000	57,000	—	—
Netherlands ..	1,049,000	1,065,000	28,000	28,000
Poland	9,023,000	8,333,000	213,000	214,000
United Kingdom ..	14,762,000	14,950,000	457,000	460,000
Spain	1,201,000	1,186,000	—	—
Western Germany ..	12,445,000	11,427,000	290,000	292,000

TABLE 2.—*European Solid Fuel Imports in May, 1961, with Figures for April, 1961, shown in Brackets (Metric Tons).*

Importing country.	Coal and patent fuel.	Coke.	Lignite and brown coal briquettes.
Austria	252,000	52,000	23,000
	(276,000)	(45,000)	(13,000)
Belgium	382,000	23,000	9,000
	(351,000)	(25,000)	(8,000)
Denmark	171,000	29,000	2,000
	(231,000)	(17,000)	(12,000)
Finland	170,000*	14,000*	—
	(205,000)*	(17,000)*	(—)
France	923,000	473,000	34,000
	(883,000)	(440,000)	(37,000)
Greece	14,000*	1,000*	—
	(15,000)*	(1,000)*	(—)
Eire	145,000*	1,000	—
	(102,000)*	(1,000)*	(—)
Italy	778,000	7,000	17,000
	(757,000)	(15,000)*	(15,000)
Luxembourg	19,000	352,000	12,000
	(16,000)	(346,000)	(11,000)
Netherlands	629,000	24,000	18,000
	(502,000)	(18,000)	(38,000)
Norway	45,000*	23,000*	—
	(28,000)*	(24,000)*	(—)
Portugal	33,000	21,000	—
	(37,000)	(21,000)	(—)
Sweden	153,000*	95,000*	—
	(168,000)	(77,000)	(—)
Switzerland	176,000	51,000	19,000
	(162,000)	(35,000)	(16,000)
United Kingdom	—	—	—
	(—)	(—)	(—)
Western Germany	518,000	41,000	398,000
	(658,000)	(20,000)	(408,000)

* Secretariat estimate.

Australian Ore Mining Agreement

AGREEMENT has been signed by the Western Mining Corporation, Limited, with the Western Australian Government under which it will spend about £A2,250,000 in exploiting the Tallering Peak iron ore deposits. The company expects to develop an export trade with Japan, and has agreed to pay a royalty of 6s. per ton on the first 2,000,000 tons of ore exported from the field.

In addition the company will provide about £A1,200,000 for rail and shipping facilities, including a railway line from Geraldtown to Tallering Peak, and diesel locomotives and rolling stock.

NEWS IN BRIEF

AS FROM September 1, the permanent address of the British Association for the Advancement of Science will be No. 3, Sanctuary Buildings, Great Smith Street, London, S.W.1.

STANDARD BERYLLIUM is to build a 100,000-ton-per-year capacity concentrating plant at its Bua Vista beryl orebody in Brazil. It is expected to be in operation early next year.

THE Bureau International de la Récupération is to hold its autumn congress at Amsterdam on November 16 and 17. The scrap iron and steel section will meet on November 16.

GLASGOW BRANCH of J. H. Fenner & Company, Limited, manufacturers of V-belts, pulleys, etc., of Hull, (Yorks) now has Telex facilities. The number is 77269. The service extends facilities already at Hull, Birmingham, London, and Manchester.

AT A HAMILTON Sheriff Court inquiry into the death of Mr. William Paterson Jackson (57), a crane driver, who fell into a wagon containing red hot ingots at the Dalzell steelworks of Colvilles, Limited, Motherwell (Lanarkshire), the jury returned a formal verdict.

LINING OF G. R. Supermag magnesite bricks, a product of General Refractories, Limited, Sheffield, contributed largely to the UK record throughput of 530,304 tons of hot metal recently obtained from a 1,200 tons capacity hot metal mixer at the Abbey Works of the Steel Company of Wales, Limited.

EARLY NEXT month the first machines are to be installed in a new factory being prepared at Sunderland (Co. Durham), for David Brown Industries, Limited, gear cutters, engineers, steel and non-ferrous founders, etc., of Huddersfield. Labour force for the new factory is expected to reach 200 by the end of the year.

AS A RESULT of a comprehensive survey of the requirements of motor industry customers, which has shown that earlier holidays are desirable, the 1,500 employees of Qualcast, Limited, lawn mower manufacturers and light repetition steel and ironfounders, of Derby, have been informed that next year's annual holiday will be brought forward to July.

THE RECIPROCAL Unemployment Insurance Agreement which the UK concluded with West Germany last year has been ratified and will come into force on September 1, 1961. The agreement covers unemployment benefit provided under the National Insurance Scheme and the corresponding scheme in Germany. Similar agreements are in force for 23 nations or states.

PRESENT methods of "fitting the man for the job" will be explained during a one-day conference of the British Institute of Management in Glasgow, on September 27. Speakers will be Mr. J. Munro Fraser, Reader, department of industrial administration, Birmingham College of Technology and Mr. Richard S. Stokes, warden, electricity council management training centre.

NEW EXPORT record was achieved in July by South Wales Switchgear, Limited, of Blackwood (Mon), which regularly sells more than 30 per cent. of its production in oversea markets. In one week, this member of the Aberdare Holdings, Limited, group, shipped more than £250,000 worth of equipment abroad, and booked more than £250,000 worth of new export orders.

A NEW RANGE of drilled, semi-tubular rivets is now being produced by Cooper & Turner Limited, Sheffield. The rivets are being produced in mild steel, copper, brass, and aluminium alloys to British Standard specifications and particularly to special order as for example where special head shapes and sizes are required. The size range is from $\frac{1}{8}$ in. to $\frac{1}{4}$ in. diameter and up to $6\frac{1}{2}$ in. in length.

WORK IS TO slow down at the end of the month on the £5,000,000 railway marshalling yard at Kingmoor, near Carlisle. The project, nearly two thirds complete, is intended to be one of the largest marshalling yards in Europe. British Railways stated that work had progressed much faster than expected and it had to be interrupted in order to keep within the budget for this year.

THE DISPUTE which began almost a month ago over the double-day shift system worked by 174 AEU men at the Scunthorpe works of the Appleby-Frodingham Steel Company, branch of the United Steel Companies, Limited, ended on Monday. The 3,000 steel maintenance workers who were on strike for three weeks decided to end the strike "in its present form." Negotiations have been resumed.

LARGEST OF their kind in Scotland, two giant fork lift trucks, capable of lifting 40,000 lb. loads, were driven under their own power from Glasgow docks to the Dalzell steelworks of Colvilles Limited, Motherwell, on Tuesday. The trucks, which will be used for lifting hot slabs of steel from the furnaces to the plate mill a quarter of a mile away, have been bought from I.T.D. Limited, Birmingham, in connection with the Ravenscraig development scheme.

FORMED SOME YEARS ago with the object of stimulating productivity, the Tyneside Productivity Committee is to be replaced by a new association with similar aims. Firms interested in the existing committee have been invited to join the new organization. Trade unions will also be represented. The proposed development is due to a belief that greater emphasis will have to be placed on productivity if Britain joins the Common Market.

MACHINES DESIGNED to take the place of human operators on factory assembly lines, which were demonstrated in London for the first time on Tuesday, are shortly to be marketed in the UK by U.S. Industries Inc. (Great Britain). Manufacture will be undertaken by the Burtonwood Engineering Company, Limited, Warrington (Lancs). The electrically-controlled equipment will, it is claimed, perform almost any repetitive task associated with hand and arm motions.

TO STUDY the mathematical nature of industrial processes, Elliott Brothers (London), Limited, a member of the Elliott-Automation, Limited, group, has created an automation analysis department, within its data processing group. In a majority of cases, it is stated, there is no precise knowledge available of the true mathematical nature of industrial processes. That lack is one of the factors delaying the extensive introduction of complex automation systems.

LATEST EXHIBIT at the Swansea Industrial Museum is a beam engine, which was used for pumping water from the Severn Tunnel. Six similar engines have been replaced by modern pumps. The 30 ft. beam and bearings of the No. 2 pump at Sudbrook were given to the museum by the British Transport Commission, which also arranged for free transfer by rail from Sudbrook to the Velindre, Swansea, works of the Steel Company of Wales Limited, where final transport and siting was arranged. The engine was built in Cornwall in 1880.

Coal in Plenty for South Africa

ONE problem attendant upon the £250,000,000 expansion programme of the South African Iron and Steel Industrial Corporation, Limited (Iscor)—finding sufficient suitable coal within comparative easy reach of its steelworks—may be solved by the opening up of a large coalfield. It is reported that the coalfield—the largest of its kind undeveloped in South Africa—is contained in an area 48 miles by 21 miles where, it is estimated, there are about 17,000,000,000 tons of coal—enough for South Africa's domestic and export needs (at the present rate of usage) for the next 500 years.

The coalfield lies near the Bechuanaland border at Ellisras, about 75 miles north of Iscor's iron-ore mine at Thabazimbi and 60 miles from the nearest railhead. It was originally prospected between 1944 and 1948, when 143 boreholes were drilled and two shafts sunk 2½ miles apart. Since 1959 Iscor has resurveyed 22 boreholes to depths of about 430 ft. Study of the cores has decided the company to reopen one of the two pilot shafts and it is intended to put in drives at intervals of 30 ft. down for the first 260 ft., which will explore the seam for about 200 ft. from the shaft.

Some 6,000,000,000 tons of bright coal suitable for coking if mixed with Natal coal have been proved in the Ellisras field and another Iscor team is drilling further north in a prospective coalfield at Waterpoort near the Rhodesian border. Less than 100 miles from Ellisras, another substantial coalfield—probably a continuation of the Ellisras field—has been discovered in Bechuanaland. This appears to have two main seams, both of bituminous non-coking steam coal at shallow depth. Reserves of good quality coal in one area are estimated at 163,000,000 tons, together with 245,000,000 tons of an inferior and more variable coal in another area.

The iron and steel industry is of growing importance in the South African economy. In the first six months of this year iron and steel products worth R8,000,000 were sold abroad. Japan took 75 per cent. of all iron and steel exports, which included 218,000 short tons of pig-iron and 15,600 short tons of steel products.

The value of Iscor's steel export orders for the first half of this year totals R8,200,000 (£4,100,000).

Iron Ore Replaces Coal as Hartlepools Main Trade

IN contrast to the rise of 150,000 tons in iron-ore imports at Hartlepools dock during the first 28 weeks of this year, there has been an almost equally marked decrease at Middlesbrough dock, where ore imports fell to 24,188 (138,421) tons. The figures show that at the Hartlepools iron-ore imports have now taken the place of coal exports as the chief activity at the dock.

The fall in the coal trade continued during the four-week period ended July 16 and the drop over the first 28 weeks of this year was some 40,000 tons to a total of 793,568 tons. Among export increases at the dock this year are iron and steel, 10,723 tons, basic slag, 48,036 tons, and limestone, 13,675 tons.

Exports of iron and steel goods through Middlesbrough dock, at 94,989 tons are about 66,000 tons less than last year.

Lord Robens Explains Moss Case

COMMENTING on the case of Mr. Arthur Moss of Barnsley, who narrowly failed to qualify for a redundancy payment, Lord Robens, chairman of the National Coal Board, on Thursday of last week pointed out that up to two years ago there was no retiring age for miners. The board then made an arrangement with the National Union of Mineworkers whereby men were compulsorily retired at the age of 65 and got redundancy payment varying with their length of service.

It was recognized that special provision should be made for men who had been away sick for some time before their 65th birthday and it was therefore agreed that, if such men worked for 10 days in the year between their 64th and 65th birthdays, they could qualify for the redundancy payment when retired at the age of 65.

Mr. Moss, said Lord Robens, ceased work at the age of 63¼ and only worked five days in approximately 21 months between then and his 65th birthday. Thus he did not qualify in accordance with the agreement made between the board and the NUM. However, he was entitled to and had received, a pension from the Mineworkers' Pension Scheme from July of last year.

Lord Robens emphasized that, with any agreement of this type, some must fail to qualify by quite small margins, wherever the dividing line was drawn.

Last Friday Mr. Moss received a cheque totalling almost £220 which had been contributed by sympathisers.

Pit Pony Competition at Notts Miners' Festival

PIT pony competition held recently at the Nottinghamshire Miners' Festival at Berry Hill, Mansfield, attracted 22 entries and the champion was Star, of Williamthorpe Colliery (Derbyshire), a 14-year-old pony that was champion of England nine years ago, entered by Mr. T. Money, of Chesterfield. Class winners were Pluto, of Moorgreen Colliery (T. H. Anderson); Harris, of Stanley Colliery (A. L. Anderson); and Ken, of Calverton Colliery (G. Butler).

The festival was opened by Mr. S. W. G. Ford, president of the National Union of Mineworkers, and other speakers were Mr. F. G. Glossop, vice-chairman of the Nottinghamshire District Welfare Committee, and Mr. A. Martin, one of the joint honorary secretaries.

Skip Winding Introduced at Cortonwood Colliery

NEW winding system which is being completed at Cortonwood Colliery, Wombwell (Yorks), while the pit workers are on holiday, will operate for both the Haigh Moor and Silkstone Seams.

Coal will be wound in skips holding 8 tons loaded at the pit bottom from conveyor belts. For the past two or three years colliers at Cortonwood have agreed to take their holidays in two successive weeks so that the conversion scheme could be carried out with less interruption to production. This year's holiday ends on August 26.

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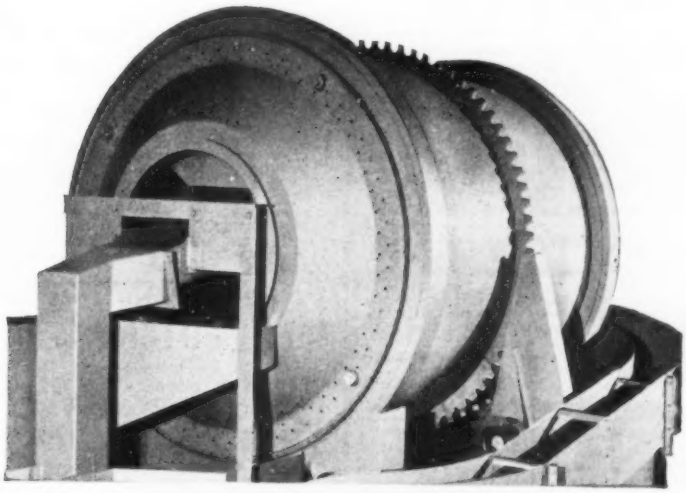

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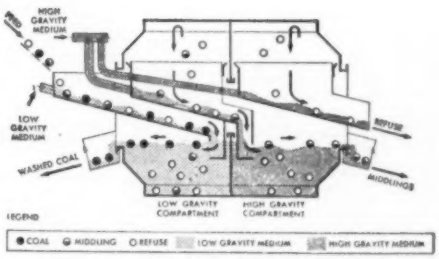

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APPLICATIONS are invited for a post as LECTURER in the Department of MINING AND GEOLOGY, commencing 1st November, 1961 or by arrangement. Candidates should have a degree or equivalent qualification or a Mining Qualifications Board Certificate of Competency together with good industrial and/or teaching experience. Candidates must be able to offer Colliery Engineering as well as general mining subjects.

Salary in accordance with the Burnham Technical Scale for Lecturers (£1,370 by £35 (4) and £40 to £1,550 per annum). Full allowance up to the maximum of the scale is given for appropriate experience.

Further particulars and application form will be sent by the undersigned. Last date for the receipt of applications: 1st September, 1961.

E. C. SMITH,
Principal.

WIGAN AND DISTRICT MINING AND TECHNICAL COLLEGE

APPLICATIONS are invited for a post as ASSISTANT LECTURER in the Department of MINING and GEOLOGY. Candidates should be graduates or hold an equivalent qualification and have good industrial and/or teaching experience; First Class Mine Manager's Certificate would be an additional recommendation. Candidates able to offer colliery mechanical or electrical engineering, coal preparation, fuel technology or geology in addition to general mining subjects preferred.

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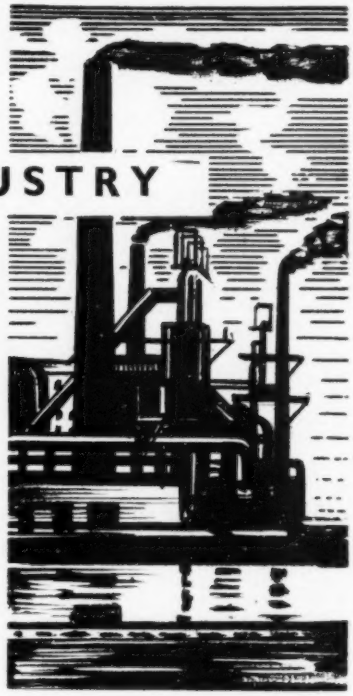

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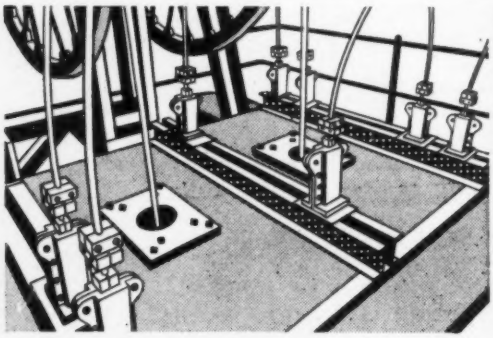

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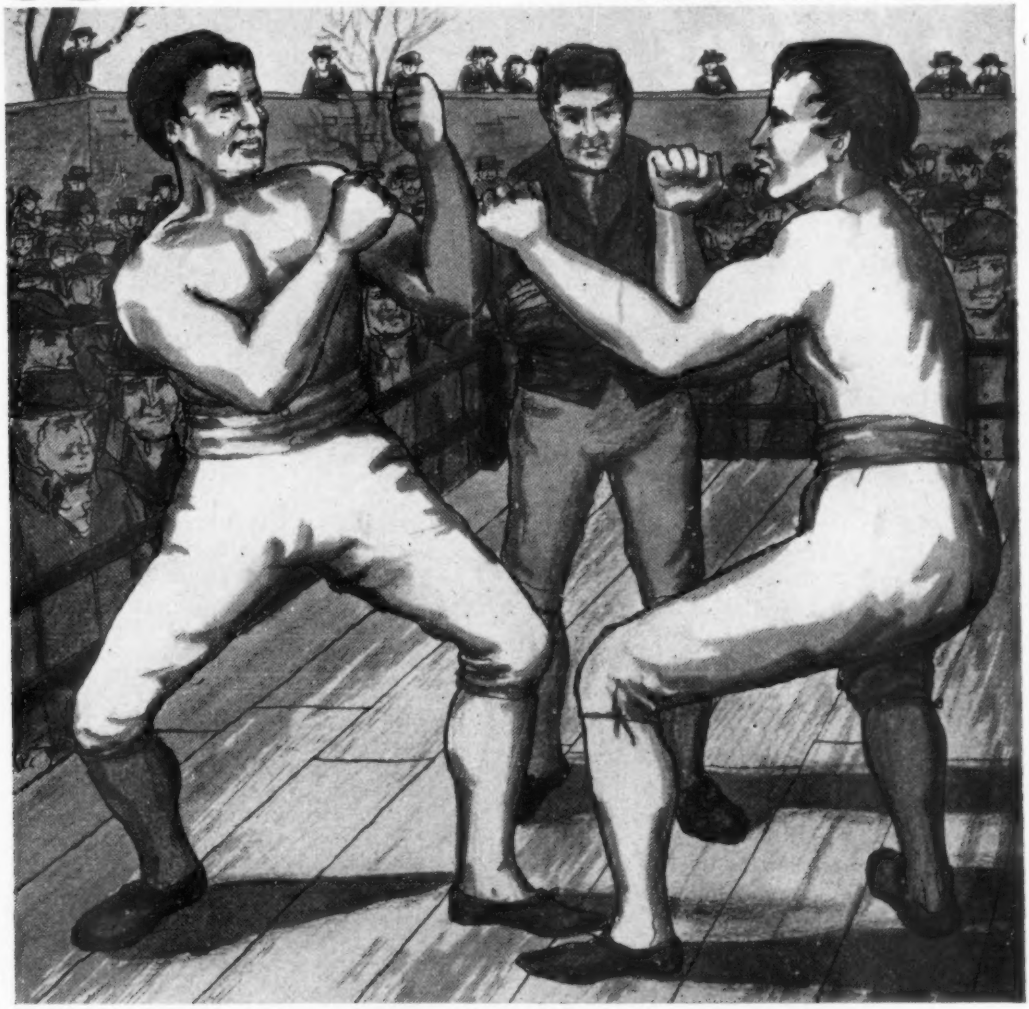

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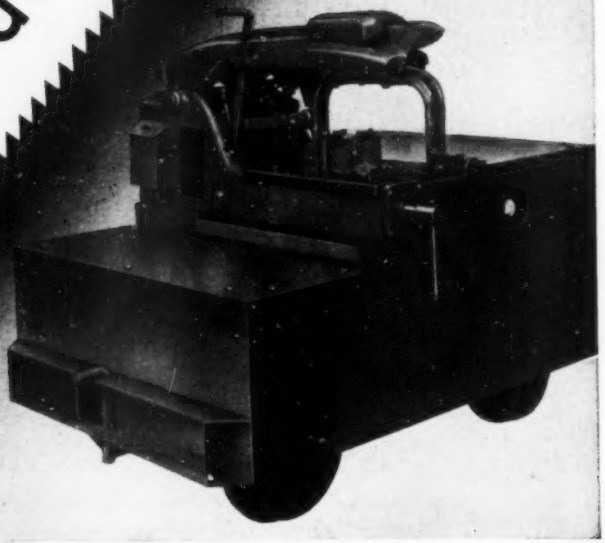

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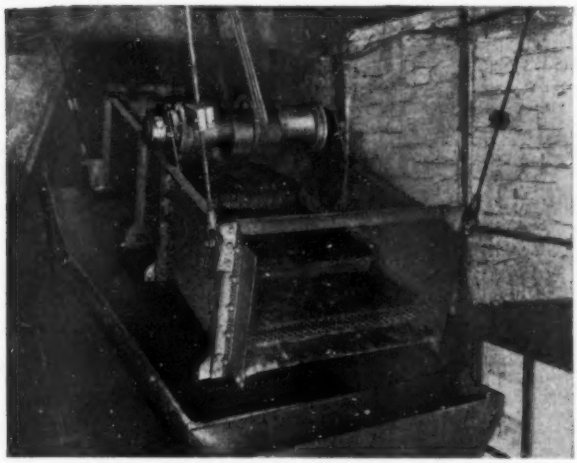

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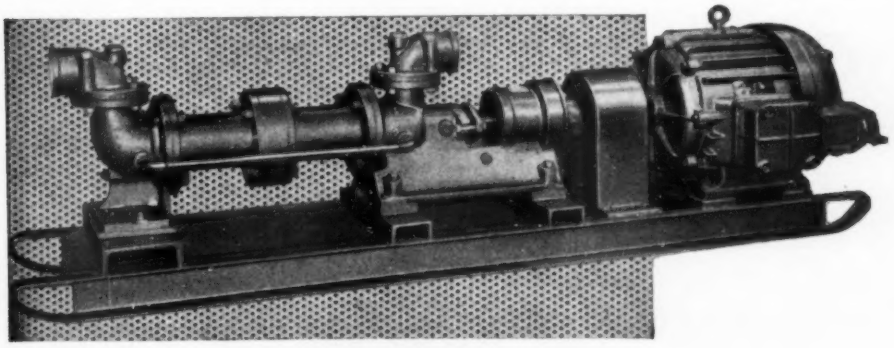

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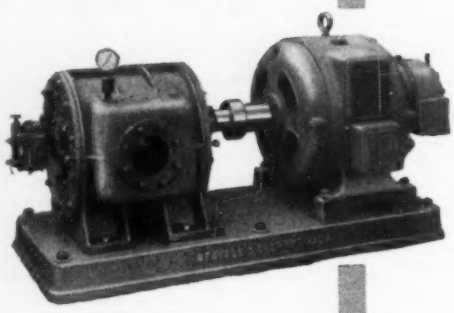

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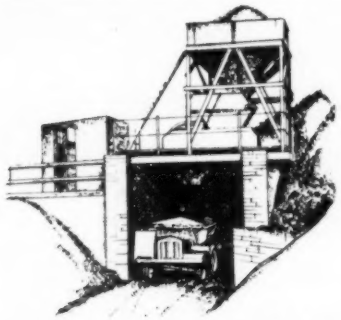

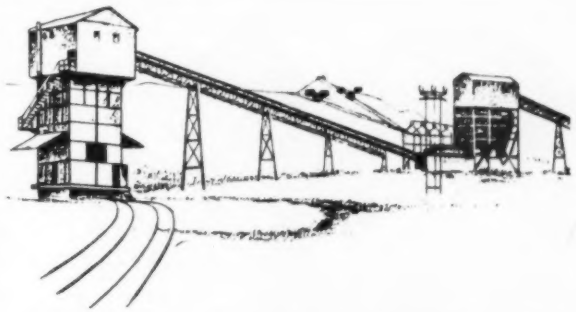

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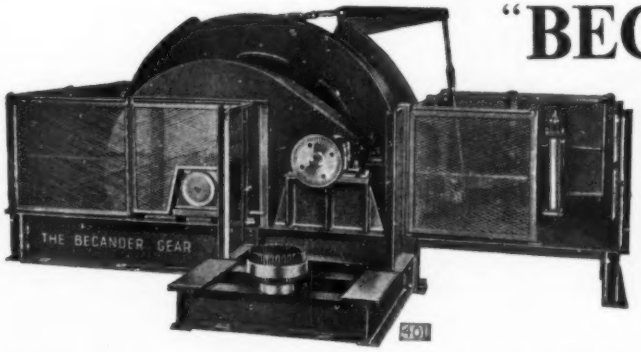

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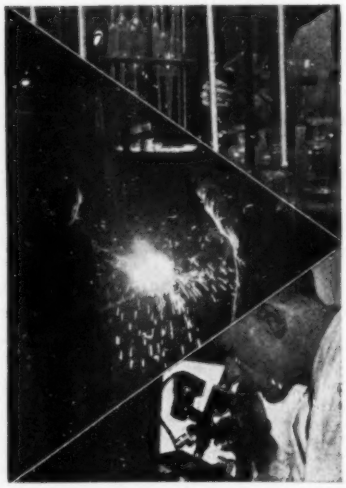

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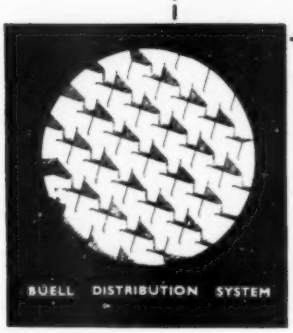

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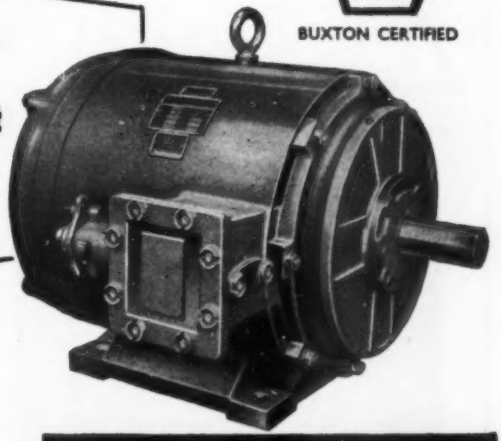

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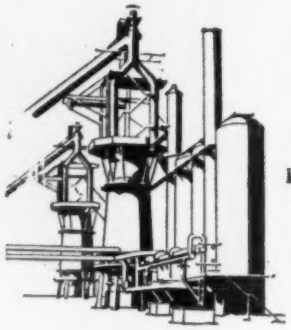

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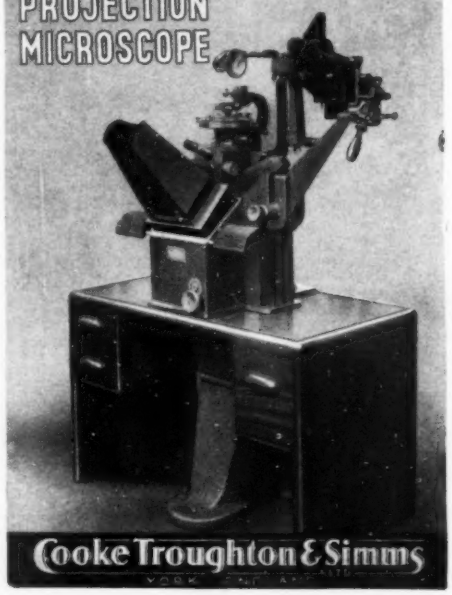

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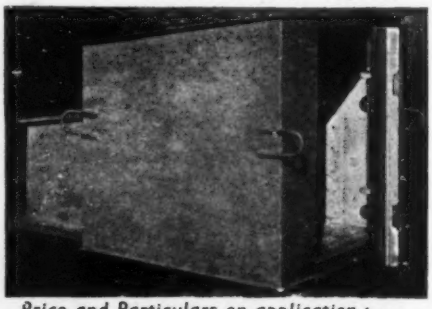

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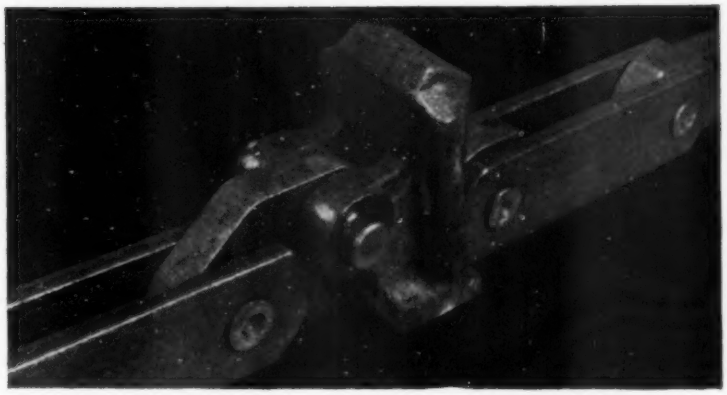

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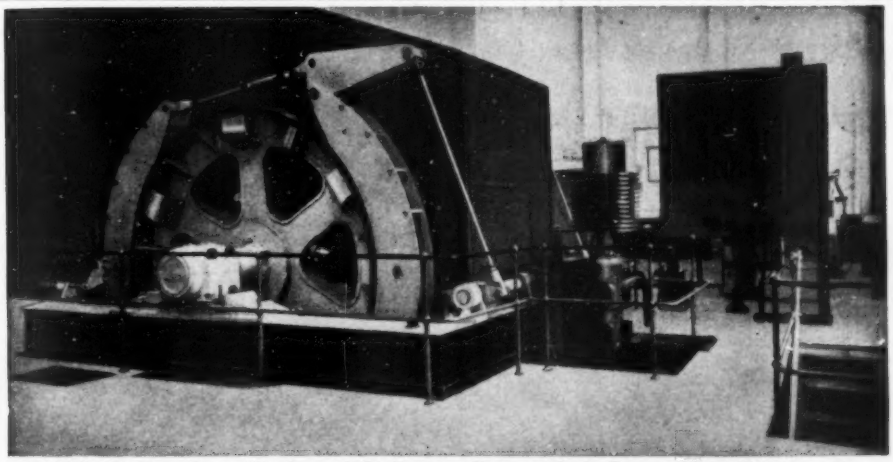

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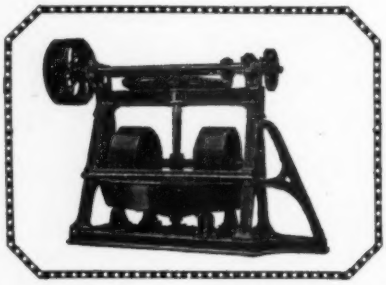

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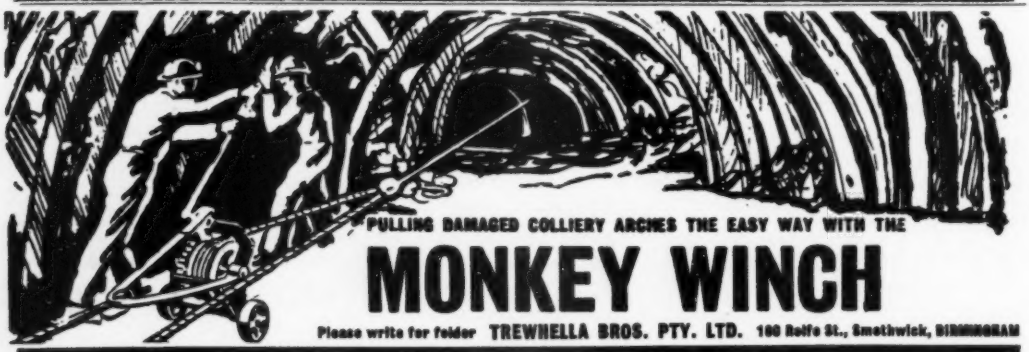

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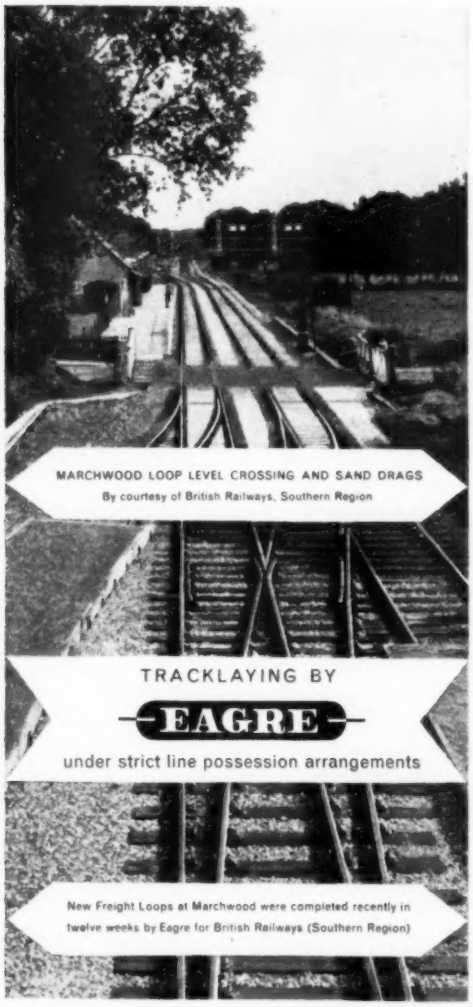
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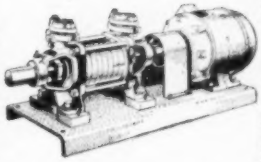

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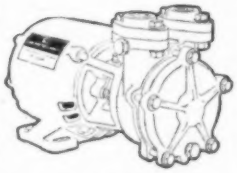

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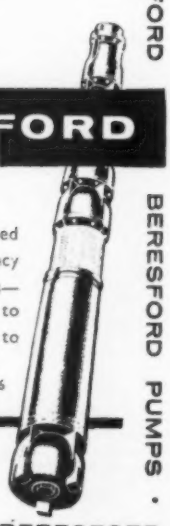

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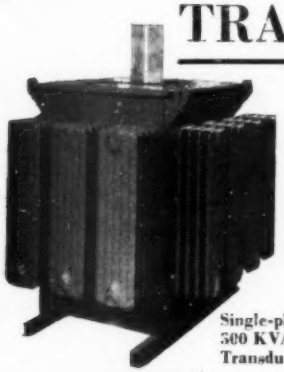

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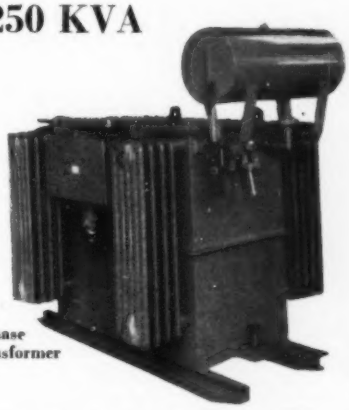

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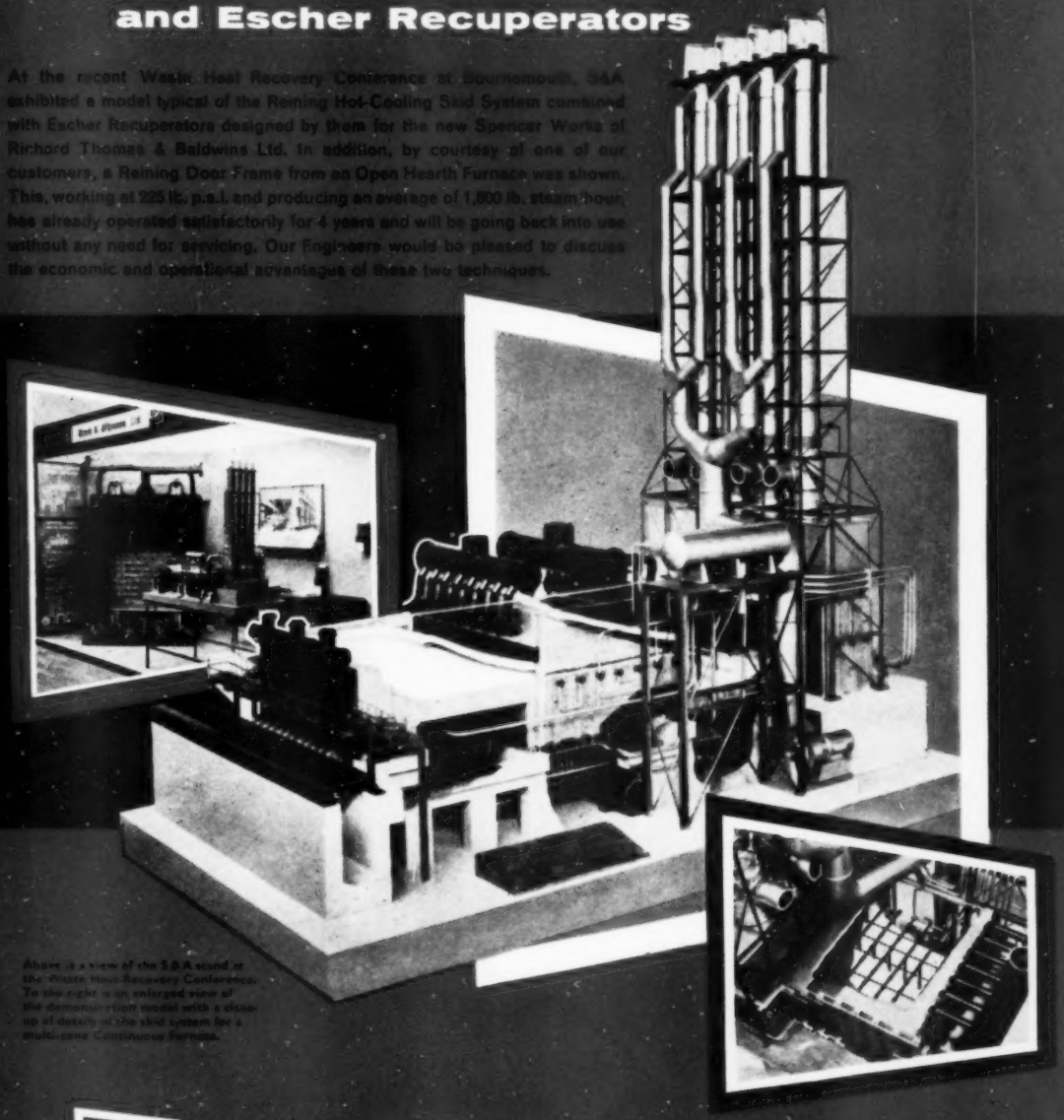
the Reining Evaporative Cooling System and Escher Recuperators

At the recent Waste Heat Recovery Conference at Bournemouth, S&A exhibited a model typical of the Reining Hot-Cooling Skid System combined with Escher Recuperators designed by them for the new Spencer Works of Richard Thomas & Baldwins Ltd. In addition, by courtesy of one of our customers, a Reining Door Frame from an Open Hearth Furnace was shown. This, working at 225 lb. p.s.i. and producing an average of 1,500 lb. steam/hour, has already operated satisfactorily for 4 years and will be going back into use without any need for servicing. Our Engineers would be pleased to discuss the economic and operational advantages of these two techniques.



Above is a view of the S & A stand at the Waste Heat Recovery Conference. To the right is an enlarged view of the demonstration model with a close-up of details of the skid system for a multi-zone Continuous Furnace.

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